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THE BATEMAN CENTENARY WHEATGROWERS' CUP.

By the Editor.

It was in April this year that the family of the late J. W. Bateman, who are the personnel of the well-known firm of J. & W. Bateman, Ltd., conceived the idea of associating the name of their father with the Centenary Year celebrations.

It was a conception ambitious, yet not pretentious, for the founder of their business made his advent in Western Australia at a time almost synchronising with the birth of the then Colony. What then could be more appropriate than to link up with the genesis and progress of the State the gradual growth, the contraction and expansion of business that followed the ebb and flow in the tide of Westralia's fortune, with the name of him who had taken risk for risk; who had looked clear sighted into the future, and banked upon the promised land of his adoption to take him to that altitude of achievement and prosperity that both the firm and the State now happily enjoy.

But every end requires a means thereto. It is easy work to think upon the past, to compare a correspondence of incidents and trace the lines of circumstance as they converge to a given point—Success.

Yet to intertwine the paths of progress without fracturing the concept of relationship between individual and communal effort requires more care ful thought. The most prominent feature of our development at the present day is found in our extensive wheat areas and improved agriculture. It is the aim of our farmers to celebrate the Centenary year with a record

harvest, and so it occurred to the descendants of the Bateman family that they might participate in the celebrations and at the same time commemorate their ancestor in an endeavour to stimulate this desideratum—a record harvest.

Our Director of Agriculture, Mr. Geo. L. Sutton, was consulted, and the advice of the Superintendent of Wheat Farms, Mr. I. Thomas, was sought, as to the methods to be employed. The donation of a Cup was the best suggestion. But what sort of a competition should it involve? There had already been competitions devised to encourage better farming and increased yields and these had been of undoubted benefit to the State; but they depended on actual yields over the whole farm, or, on district team work. The donors desired to break away from the beaten track and seek a fresh avenue for their enterprise. After suggestions and consultations it was decided to present a gold Cup valued at £50 the conditions of competition being entirely novel to the State, and, as far as is known, to any part of the Commonwealth or the world. These conditions have been made widely known already. It will be a Centenary Cup to become the sole property of the successful competitor. It can be won but once. Whether another Centenary Cup will eventuate one hundred years hence does not concern the present generation.

The Bateman Centenary Wheatgrowers' Cup is unique in that respect and in keeping with this fact the award will be made, not on the yield per acre, which gives to the farmer in the better rain belt a decided advantage, but it will be on the yield per acre per inch of rainfall during the conventional growing period, from May 1st to October 31st inclusive; and each competitor must harvest not less than 200 acres for grain. The average yield will be ascertained from the total area harvested for grain. The Judge will visit each competitor's farm and measure up the stripping area also ascertaining the quantity of wheat on hand. On or before the 31st January the farmer will be required to furnish a sworn declaration as to the quantity of wheat sold from the competing holding. This will have to be supported by agent's dockets and the declaration will include the amount retained for seed and other purposes. From the information thus obtained the average yield per acre will be computed. Arrangements have been made with the Commonwealth Meteorological Bureau to supply, as nearly as possible, the rainfall around the competitors farms during the period already mentioned.

The salient feature of the competition is to ensure, as far as humanly possible, that the award shall be for merit. Those who decide to enter the list of competitors—and it may be mentioned that there is no charge of any kind for entry—are assured that the result of their efforts cannot be easily affected in an adverse way. Entrants from the outer fringes of the wheat belt have equal opportunities with those in the more favoured zone, a factor which should inspire courage and interest.

The donors of the Centenary Cup are to be congratulated on their patriotic efforts as are also those who conceived the principles of the competition. The Cup itself, which is here illustrated, is seen to be a beautiful specimen of the goldsmith's art designed with a simplicity that provides much of its charm. It is fashioned from gold taken from our own mines, for which the State is so famous, and stands upon a plinth made from our own West Australian jam wood, typical of our wheat areas. On the face of the burnished bowl is inscribed in conventional text—

Presented by the Family of the Late J. W. Bateman

To the grower who, with a minimum of 200 acres obtains the best average acre yield of wheat per inch of rain which fell during the growing period, May 1st to October 31st in the season 1929.

Won by

.....

The plinth bears a gold shield on which appears the following:—

Number of acres cropped.
Average yield per acre.
Average yield per inch of rain.
Number of Competitors.

Manufactured from the product of an industry which gave that stimulus to the State that caused its leap from comparative obscurity into brilliance: that prominence, popularity and prosperity that fostered the agricultural industry and discovered our wonderful grain-growing potentialities, it typifies how at this, the end of our first century, these have been realised.

Every farmer should be attracted to this competition, for he who by his industry and perseverance succeeds in winning this unique Trophy will have something to hand as an heirloom to his proud descendants, for all time—The Bateman Centenary Wheatgrowers' Cup.

FRUIT PRODUCTION AND EXPORT.

Geo. W. Wickens.
Superintendent of Horticulture.

The Fruit Industry in Western Australia has celebrated the State's Centenary year by producing a record crop, the major portion of which was sold at prices which meant a distinctly profitable return to growers. Not all kinds of fruit, nor all growers have been equally fortunate, for while stone fruit and grape crops were up to the average, the pear crop was a little under, and the citrus crop considerably under the average; the apple crop, however, was the best the State has known, and as 54 per cent. of the area under orchards (apart from vineyards) is comprised of apples, the total production of fruit in 1929 easily constitutes a record. The final figures regarding production will not be available until September next, but the quantity exported shows that the original estimate made in December last of 1,100,000 cases of apples was a conservative one, and will be exceeded. The previous heaviest apple crop occurred in 1927, when 901,464 cases were harvested, and in that year also, the largest number of cases up to that time were exported: the overseas shipments totalling 494,641 cases and Eastern States consignments 53,560 cases. To the 30th June this year the overseas shipments of apples amounted to 654,982 cases and Eastern States consignments 166,032 cases.

The total quantity of all kinds of fruit shipped from Western Australia to overseas markets for the year ended 30th June, 1929, amounted to 737,676 cases: of these 732,219½ cases were exported during the period from 1st January to 30th June, 1929, the remainder—5,456½ cases—comprised portion of last year's production and were exported during the six months ended 31st December, 1928.

The Continent of Europe received 445,253¼ cases, or 60 per cent. of the total quantity: Great Britain 209,875¾ cases and the balance—82,547 cases—were sent to Singapore, Colombo, Sourabaya, Batavia, Port Said, Durban and Mauritius.

During the season from 20th February to 14th May, 1929, twenty-seven boats loaded fruit from Western Australia for Great Britain and Europe: 410,813 cases being shipped at Fremantle and 244,316 cases at Albany.

Shipments during the various months were divided up as follows:—

	Great Britain cases.	Continent of Europe. cases.
February	2,987 ..	
March	83,705½ ..	298,312¼
April	95,078 ..	131,489
May	28,105¼ ..	15,452
	209,875¾	445,253¼

Full particulars showing quantities and destinations are as follow:—

EXPORT OF FRESH FRUIT FROM WESTERN AUSTRALIA FOR YEAR ENDING 30TH JUNE, 1929.

Destination.	Apples.	Pears.	Grapes.	Peaches.	Plums.	Nectarines.	Tomatoes.	Rock Melons.	Passion Fruit.	Quinces.	Persimmons.	Oranges.	Lemons.	Totals.
	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.
Colombo	9,706	10	16,761	2	39	6	...	...	...	...	...	490	...	27,014
Singapore	17,664	308	9,320	55½	161	3	12	...	...	...	...	1,601	76	29,200½
Sourabaya	10,332	151	3,211	24	92	...	...	5	...	...	...	162	10	13,987
Batavia	3,086	228	1,769	...	27	...	...	...	...	...	...	577	55	5,742
Port Said	5,119	102½	274	11	7	...	...	...	...	...	...	...	...	5,513½
London	130,051	19,964¾	15,883	6	15	...	...	...	4	31	3	...	...	165,957¾
Hamburg	344,718	8,588	123	...	...	...	...	...	...	37	...	...	...	353,466
Rotterdam ...	30,718	...	...	...	...	...	...	...	...	...	...	...	...	30,718
Gothenburg ...	9,797	...	...	...	...	...	...	...	...	...	...	...	...	9,797
Dunkirk	327	...	...	...	...	...	...	...	...	...	...	...	...	327
Stockholm	49,354	836¼	145	...	...	...	...	...	...	...	...	...	...	50,335¼
Mauritius	150	...	40	...	...	...	...	...	...	...	...	...	...	190
Antwerp	610	...	...	...	...	...	...	...	...	...	...	...	...	610
Liverpool	14,852	178½	500	...	...	...	...	...	...	25	...	...	...	15,555½
Glasgow	10,485	107½	366	...	...	...	...	...	...	...	...	...	...	10,958½
Hull	17,113	...	291	...	...	...	...	...	...	...	...	...	...	17,404
Durban	900	...	...	...	...	...	...	...	...	...	...	...	...	900
	654,982	30,474½	48,683	98½	341	9	12	5	4	93	3	2,830	141	737,676

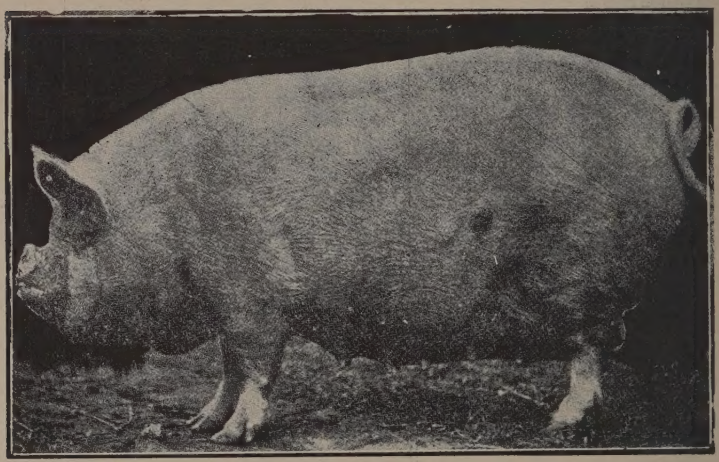
PIGS AND PIG-RAISING.

(*Continued.*)

P. G. HAMPSHIRE,
Superintendent of Dairying.

YORKSHIRE.

Origin Yorkshire, England. Bred from the old English hog, a large white animal. The small Yorkshire derives its refinement to Chinese crosses, and the Middle Yorkshire to a cross between the two. The Middle Yorkshire was classed separately in 1852. Improvement commenced about 150 years ago. Yorkshire blood widely diffused throughout the world in all white breeds.



A Middle Yorkshire Sow.

Characteristics—

Relative size.—The Large Yorkshire is probably the largest of the breeds, and one of the heaviest, if not the heaviest. Middle Yorkshire and Small describe their size.

Adaptability.—Excellent for bacon and pork, especially where large sides are required. Good doers, excellent for crossing upon weaker types. Inclined to sun scald; prefer cool climate owing to this liability.

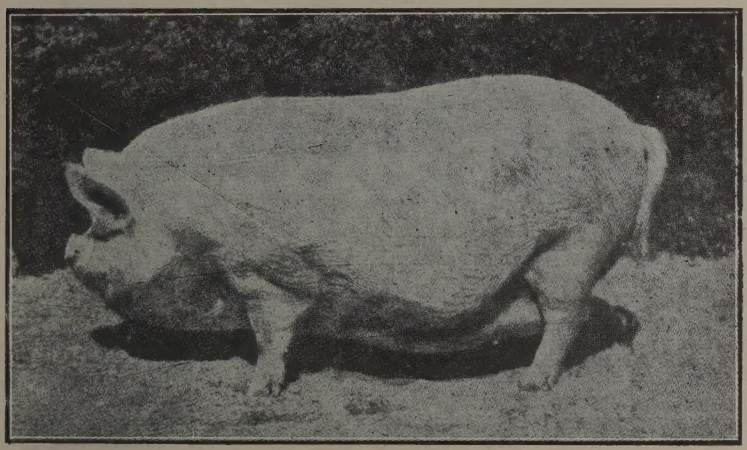
Maturing qualities.—Large Yorkshire, not so quick as smaller varieties. Requires from six to nine months for market bacon.

Grazing and feeding qualities.—Graze and forage well in cool climate. Gentle disposition. Must be plentifully supplied with food to make economical flesh. Look wretched out of condition. Compare unfavourably with black breeds. Not as hardy as Berkshire. Good growers, sty fed.

Quality of meat.—Good, especially for large "side" markets. Fat and lean, fairly well balanced. The Small Yorkshire excels as a porker.

Value for crossing or grading.—For small fine boned sows good, will increase size, improve vigour, improve quality of meat, and increase prolificacy.

Breeding qualities.—Excellent, regular large litters and good mothers. Good tempered, gentle and tractable.



A Small Yorkshire Sow.

Principal points—

Head.—Long, lightish, wide between eyes.

Ears.—Long, fine, inclined forward.

Jowl.—Light.

Neck.—Long, muscular.

Shoulders.—Sloping, no coarseness.

Back.—Long, wide, straight or slightly arched.

Barrel.—Deep, full rounded, well sprung ribs, flanks well let down, long, wide, square.

Hams.—Broad, full meat to hocks.

Legs.—Straight and strong.

Feet.—Firm.

Skin.—Cream colour, freedom from wrinkles or dark spots.

Hair.—Long, straight, fine.

Colour.—Pure white.

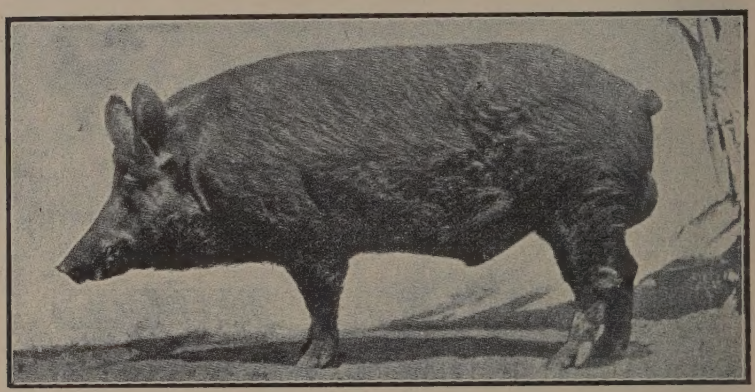
Objections.—Ears, coarse, flopping; shoulders, coarse; weak back; unshapely hams; weak loins; crooked legs; weak feet; coarse curly hair; action, sluggish.

Disqualifications.—Black or red hair or spots on skin.

Middle Yorkshire differs from Large Yorkshire in reduction in size, weight, length, and has a distinctly short snub nose and short neck.

TAMWORTH.

Derive name from Tamworth, Staffordshire, England, where they have been bred for a long period. They are probably the oldest and purest of all breeds in England. This (as in all breeds of pure animals) accounts for the wonderful, marked prepotency of the Tamworth. At the beginning of the 18th century they were noted for large proportion of lean meat they produced. Have been greatly improved by selection, but it is generally conceded that no mixture of the breeds has been introduced in improvement. As early as 1847 they were given premier honours in competition with other large breeds at Royal Agricultural Show, England. Following this they went out of favour, but regained popularity from 1880 onwards.



A Tamworth Boar.

Characteristics—

Relative size.—At least second to Large Yorkshire, and in some cases even larger. Hardihood and vigour in keeping with size.

Adaptability.—Unexcelled.

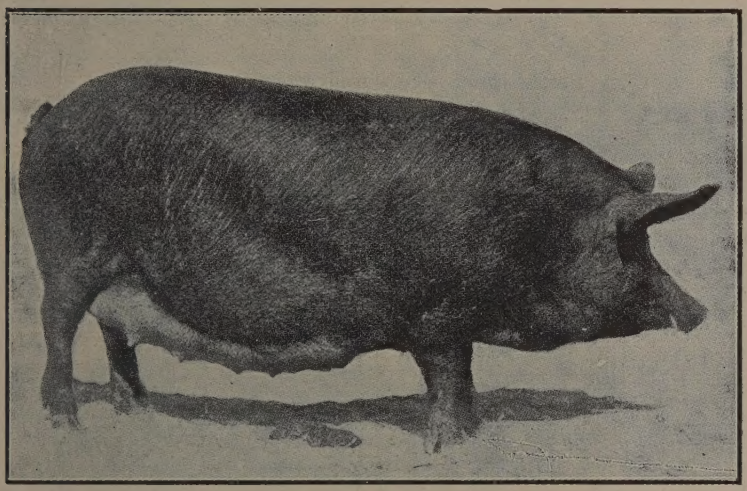
Maturing qualities.—Comparatively slow, not equal to the smaller or refined breeds.

Grazing and feeding qualities.—Excellent grazers, wonderful foragers. Exceptionally hardy; will stand forced feeding. Very suitable open conditions. Powerful digestion, but must not check growth.

Quality of meat.—Excellent on account of leanness. Bone coarse. Exceptionally good to cross with to improve meat for bacon. Less waste in cooking, good flavour.

Value for crossing or "grading up."—Excellent when crossed with small compact over refined grade sow. Impart size, development, vigour, and prolificacy, more and better meat (very big factor). Good growers. Good mothers. Excellent travellers to market.

Breeding qualities.—Unexcelled for prolificacy and hardiness, freedom of parturition troubles. Ideal mothers, rarely overlies her young, great defenders, good sucklers.



A Tamworth Sow.

Principal points—

Head.—Long, lean, light, tapering to snout.

Ears.—Moderate size, fairly erect, pointing forward.

Jowl.—Light.

Neck.—Long, rather deep than wide, tapering.

Shoulders.—Sloping, good thickness through heart.

Back.—Moderately wide, long, slightly arched.

Barrel.—Long in coupling, deep ribs, well sprung.

Rump.—Deep, fairly full, rounded.

Ham.—Large, gradually rounded off rather than square.

Legs.—Moderately long, strong, firmly placed under body.

Skin.—Smooth, plentifully covered with hair.

Hair.—Freedom from coarseness.

Colour.—Bright golden red, no black.

Objections.—Shoulders coarse, open at top. Ribs flat, weak coupling, shallow body.

Disqualifications.—Black or white hairs. Black skin.

(*To be continued.*)

"THE JOURNAL OF AGRICULTURE"

will be supplied free *on application* to any person in the State who is following Agricultural, Horticultural, or Viticultural pursuits, to Agricultural Societies or Associations, and to any person otherwise interested in Agriculture.

A charge of Threepence per copy will be made for the *Journal* to persons other than the foregoing, or who do not reside in the State. These applications accompanied by the requisite amount, must be forwarded to the Director of Agriculture, Department of Agriculture, who will also receive all correspondence dealing with the conduct of the *Journal*.

Editors of agricultural and country papers are invited to reproduce any of the articles contained in this *Journal*, providing the usual acknowledgment is made.

If you are not receiving the *Journal*, which is issued quarterly, and wish to do so, please forward your name and postal address to the Director of Agriculture, Perth.

CHAPMAN EXPERIMENT FARM.

BUNT RESISTANCE TEST—1928.

D. R. BATEMAN,
Seedsman.

This experiment is planted to test the liability or resistance to Bunt of all new fixed cross-breds from the Merredin and Chapman Experiment Farms, and also any varieties of promise from other sources.

NEW CROSS-BREDS ARRANGED ACCORDING TO INFECTION AS COMPARED WITH BOORAN 100 PER CENT.

Reg. No. P.	Variety of Cross-bred. Resistant.	1928.	1927.	Reg. No. P.	Variety. Fairly Resistant. 1–20.	1928.	1927.
C 74	D.A.C. 4179 x Florence			C 76	Minister x Toby's Tusk		7
C 80	Dindiloa x Nabawa			C 81	Florence x Nabawa		5
C 86	Florence x Velvet Don			C 77	Florence x Carrabin	1	2
M 28	Dindiloa x Nabawa			M 32	Florence x Fortune	1	9
M 29	Dindiloa x Nabawa			C 73	D.A.C. 4179 x Florence ...	3	3
M 30	Dindiloa x Nabawa			M 24	Florence x Carrabin	3	11
				M 33	Florence x Nabawa	3	11
				M 27	Nabawa x Carrabin	7	2
				M 25	Nabawa x Carrabin	9	16
				M 26	Nabawa x Carrabin	11	20
				C 82	D.A.C. 4179 x Nabawa ...	16	...

Reg. No. P.	Variety. Susceptible. 21–50.	1928.	1927.	Reg. No. P.	Variety. Very Susceptible. 51—100 or over.	1928.	1927.
C 65	Huguenot x India 5	...	29	C 84	D.A.C. 4179 x Nabawa ...	17	85
C 85	D.A.C. 4179 x Nabawa ...	9	39	C 68	Currawa x Gluyas Early ...	51	69
C 69	Warren x Bayah	15	42	C 67	Toby's Tusk x Nabawa ...	83	92
M 23	Federation x Carrabin	23	24	C 78	Clubhead x Vindesso	113	110
C 70	Federation x Bunyip	23	26				
C 83	D.A.C. 4179 x Nabawa ...	28	32				
C 66	Hard Federation x Gluyas Early	36	...				
M 31	Gluyas Early x Nabawa ...	28	47				

VARIETIES ARRANGED IN ORDER, AS COMPARED WITH BOORAN 100 PER CENT.

Reg. No. P.	Variety. 0 per cent.	1928.	1927.
1460	Piastre	...	...
1753	Minfior	...	...

Reg. No. P.	Variety. 1—20 per cent.	1928.	1927.
1705	Nabob	4	5
1713	Churkha	6	...
1451	Bunge No. 1 x Emmer	9	13
1801	Yetna	10	3
1785	Aussie	11	...
1756	Wardfir	17	12

Reg. No. P.	Variety. 21—50 per cent.	1928.	1927.
1714	Gallipoli	9	23
1786	Riverina	12	50
1746	Minyip	13	25
1697	Ranee	14	27
1710	Rajah	18	50
1706	Krithia	18	25
1608	Golden King	21	...
1727	Boolaroo	25	35
1696	Confederation	28	35
1614	Bena	28	40
1709	Marmora	30	25
1715	Babakin	34	27
1779	Bluestem (Nabawa)	35	19
1695	Sepoy	37	29
1700	Alliance	38	45
1188	Cowra, 26	44	42
1741	Omrah	49	23
1182	Wandilla	50	40

Reg. No. P.	Variety. 51—100 per cent or over.	1928.	1927.
1610	Akakomuga	25	67
1627	Waratah	25	84
1752	Currawa x Minister	29	52
1736	Boonoo	29	56
1708	Mahratta	29	70
1777	Union	33	87
1748	Currawa x Minister	18	60
1601	Crossbred 12	36	87
1775	Bredbo	36	90
1774	Duri	38	90
1536	Barwang	40	62
1750	Indcret	41	80
1770	Millard	42	121
1744	Dookie Delta	51	83
1513	Onas	53	77
1754	Gluclub	53	86
1602	Crossbred 78a	54	68
1512	Felix	56	27
1729	Canimbla	63	92
1712	Sterling	64	95
1721	Lilydale	68	...
1609	Nugget	69	56
1702	Empire	72	87
1711	Viceroy	75	70
1755	Federation x 1878	75	118
1739	Exquisite	78	113
1463	Patriot	78	127
1726	Bobin	85	100
1701	Parsee	85	116
1704	Sovereign	86	95
1773	Early Bird	87	10
1698	Capitol	88	93
1776	Dollar	88	77
1749	Federation x Nabawa	95	95
1449	Bunge No. 1 x I.P. 4	99	87
1728	Cadia	103	88
1703	Mogul	103	91
1792	Joffre	116	...
1382	Triumph	143	106

COMMUNITY SPRAYING AT GOSNELLS.

CHAS. SIMMONS,
Orchard Inspector.

At the Annual Meeting of the Gosnells Fruit Growers' Association, at which there were present the Director of Agriculture (Mr. Geo. L. Sutton), the Superintendent of Horticulture (Mr. G. W. Wickens) and the Economic Entomologist (Mr. L. J. Newman), several speakers spoke enthusiastically of the co-operative baiting which had been carried out in the district to combat Fruit-fly.

The Director of Agriculture was so impressed with the success of the scheme that he requested me, as Orchard Inspector for the district, to prepare, for publication in the *Journal of Agriculture*, the following article, which contains full details of the scheme.

The Gosnells District Growers' Association provide its members with a service of community spraying for the control of Fruit Fly throughout the summer season.

A committee chosen by the members of the association meet and appoint the men who do the work of spraying. The man provides the vehicle and the knapsack spraying apparatus. The association provides the bait. Green's Fruit Fly Bait is the lure used. It is a local product, and has been found to be effective.

In the 1928-1929 season two men were engaged at 18s. per day, who worked four to five and a-half days per week each from 12th November to 7th May, 1929.

The district covered by the spraying comprised Maddington, Gosnells, and Kelmscott, and over 90 per cent. of the growers within that area came into the scheme.

This area covered a piece of country 10 miles long and two to three miles wide, mainly running along the banks of the Canning River. It was divided, each man taking half, and arranging his round so as to be at each orchard every seventh day. The sequence of visits was adhered to, except when interrupted by violently windy mornings or by wet days.

A sufficient quantity of bait for the day's work was carried in the vehicle, and mixed as required.

The men went into the orchards and sprayed the trees carrying fruit sufficiently developed for the Fruit Fly to use as a depository for eggs, and in addition a proportion of all the lemon and orange trees were sprayed; the idea being to bait the likely feeding places of the fly.

A count was kept of the trees sprayed each time in every orchard, and a record of the time taken in spraying.

On completion of each visit the orchardist signed a book made out in the following manner (copy of actual record):—

ROUND No. 5.

Date.	Name and Address.	Trees Baited.	Orchardists Signature.	Time.
13–12–28	Godber, Gosnells Road ...	18	G. Godber	8·50
13–12–28	Taylor, Gosnells Road ...	32	J. Taylor	9·15
13–12–28	Smith, Gosnells Road ...	13	B. Smith	9·30
13–12–28	Lauterbach, Fremantle Road ...	72	E. Lauterbach ...	10·15
13–12–28	Hosken, Fremantle Road ...	99	T. Hosken ...	11·10
13–12–28	Chapman, Fremantle Road ...	10	Out	11·30
13–12–28	Armstrong, Fremantle Road ...	33	S. Armstrong ...	11·55
13–12–28	Wilkinson, Homestead Road ...	27	J. Wilkinson ...	1·45
13–12–28	Pritchard, Homestead Road ...	43	A. Pritchard ...	2·40
13–12–28	Investments, Ltd., Homstead Road	57	R. Lohrman ...	3·55
13–12–28	Lissiman, Homestead Road ...	300	N. Lissiman ...	5·20
13–12–28	Dagleish, Homestead Road ...	9	A. Dagleish ...	5·35
13–12–28	Albutt, Homestead Road ...	9	Out	5·45
	Trees	722	Orchards ...	13

This day book remains with the sprayer, and serves as a record from which the man renders his account. It is a necessary record to meet any query regarding the date of a sprayer's visit, and shows to the committee the number of trees sprayed.

At each fortnightly meeting of the committee the men employed present an account of the rounds completed, and these reports remain in possession of the secretary. Herewith is a copy of such a report:—

1928–9.

REPORT ON 5TH ROUND—FRUIT FLY BAITING.

Date.	No. of Trees Baited	No of Orchards	Remarks
11–12–28	609	14	
12–12–28	741	17	
13–12–28	722	13	
14–12–28	446	12	Saturday, 15th, East wind; 14th showers till 2 p.m.
17–12–28	394	3	
18–12–28	369	11	
Totals	3,281	70	

Time: 5 days

Additional members: Mr. Jones, Mills Road; Mr. Hayes, Wheatley Road.

Signed: W. H. Gauthern.

On the adoption of reports as shown, the Secretary then pays the wages accounts.

By the end of the season the records of the rounds of sprayings for the two men were:—

Rounds.	Number of Trees Baited.	Number of Orchards.	Days Labour.
1st Round. 17–11–28	Trees. 7,441	Orchards. 107	Days. 11
2nd Round. 24–11–28	7,637	124	10
3rd Round. 1–12–28	7,496	131	10½
4th Round. 10–12–28	8,804	144	10½
5th Round. 18–12–28	8,415	147	10½
6th Round. 28–12–28	7,799	146	11
7th Round. 9–1–29	6,375	120	10½
8th Round. 18–1–29	6,397	117	9
9th Round. 26–1–29	6,457	111	8½
10th Round. 6–2–29	6,282	107	8½
11th Round. 19–2–29	6,350	109	8½
12th Round. 2–3–29	7,254	120	12
13th Round. 12–3–29	6,489	115	10
14th Round. 20–3–29	6,732	114	9½
15th Round. 30–3–29	6,392	113	9½
16th Round. 12–4–29	6,595	112	9½
17th Round. 22–4–29	6,331	107	9½
18th Round. 1–5–29	6,662	94	9
19th Round. 6–5–29	1,010	26	2½
19 Rounds.	126,918	2,164	180

Approximately 12 orchards per day were sprayed by each man. Between 57 and 58 trees was the average number sprayed in each orchard per visit. An average of 705 trees were sprayed by each man per day. Approximate cost (labour only) per tree, three-tenths of a penny.

From 12th November, 1928, to 5th May, 1929, 126,918 trees were sprayed, at a cost of 180 days (labour) at 18s. per day, £162; workers' compensation insurance, £1 8s. 9d.; 84 gallons Fruit Fly lure, £32 1s. 6d.; total £201 10s. 3d., an average cost per tree of two-fifths of a penny.

The 1928-1929 balance sheet of the Gosnells' District Association covers a period of 15 months, the departure from the usual 12 months being caused by the alteration of the date of the annual general meeting to a more convenient time.

During that period 137,843 trees were baited, at a cost of £229 10s., or approximately three-eighths of a penny per tree.

In order to collect the money to cover the cost of spraying, the association instituted two charges, one of 2s. 6d. membership fee for the payment of hall rent, printing, stationery, and postage; and another to cover the cost of wages, insurance, and bait. This was fixed on a graduated scale based on the number of trees each member owned.

These charges, adopted for the ensuing year, are membership fee 2s. 6d., and for spraying trees for the summer season, up to and including 12 trees, 7s. 6d.; 25 trees, 12s. 6d.; 50 trees, £1; 100 trees, £1 5s.; 350 trees, £3 7s. 6d.; over 350 trees, 2s. for each additional 100.

Considering the cost of spraying per tree as ½d., a Dunhelm peach tree can be sprayed from 11th November to 30th December for threepence. A pear tree sprayed from 4th January to 30th April for fourpence. A Late Valencia orange tree from 11th November to 11th February for fourpence.

The amount of bait used each time of spraying per tree varies from ½ to 1 gill, according to the size of the trees. Fig trees, of course, take more.

Every stone fruit, pear, apple, quince, fig, persimmon and guava tree is sprayed, but it has been found effective to spray only every third or fourth row of orange and lemon trees, except toward the end of the season for late Valencia oranges, when every tree is sprayed.

When, four years ago, the Gosnells District Growers' Association started this scheme, it was hoped that the continued and regular use of Fruit Fly bait would stop the great losses then being suffered by its members, and in this the association has been entirely successful.

No member of the association has had a case of fruit condemned in the markets last season, nor has the inspector had occasion to order fruit to be stripped off the trees.

The writer took over a neglected orchard in January this year, containing peach, plum, pear and fig trees. Ten shillings covered the cost of spraying from January to May, and the fruit came through the season without any loss by Fruit Fly; while three miles away, at Armadale, outside the sprayed area practically every late peach, pear, and fig had to be stripped off and destroyed, because of Fruit Fly infection.

The effect of such efforts as this of the Gosnells District Growers' Association is to stimulate the growers in the habit of picking up their fallen fruit. It enhances the market value of the fruit. It increases the orchard values on the properties, and while encouraging the growers to take care of the orchards they already have, they also feel safe in planting new areas, confident they can prevent losses from Fruit Fly.

A PINK FLOWERED SUBTERRANEAN CLOVER.

A. B. Adams, B.Sc. (Agr.)

This season a new type of Early Subterranean Clover has been noticed in the First Early Subterranean Clover pasture at Muresk Agricultural College.

There are a number of plants of the new type growing close together, and this shows that at least one plant of the same type was growing there last year.

All the plants in this particular cluster are similar to each other in appearance which would appear to indicate that they are the produce of a sport or variation rather than the result of a natural cross between two varieties. Had it been a case of crossing differences in type would have been expected in the second generation. The chief differences between normal First Early Subterranean Clover and the new variety, if it may be called a new variety, are in colours of the flowers, leaves and stipules.

The normal variety has midway of the leaflet a half-moon shaped light green mark across it, the first broad leaves formed by the young plant have a brown or reddish mark nearer the base of the leaflets than the light mark but this dark mark is not present on the older plants.

The stipules have dark red veins with the red colouration spreading out from the veins.

The flowers are white or a very light pink, if pink it is usually on first opening and the pink colour disappears later.

The variation has dark green leaves quite free of any lighter markings.

The stipules have green veins.

The flowers are salmon pink when open and a light red in the bud.

It is too early to say whether or not this new type is of economic importance, but it is of interest as an instance of variation and it raises the hope that other variations may occur in the existing varieties and that such variations may be improvements in the kind now grown.

FARMERS' TRIALS.

POTATO FERTILISER EXPERIMENT AT BENGER.

J. C. Palmer,
Potato Inspector.

In order to test the effect of varying the quantity of plant food applied as fertiliser to the potato crop, experiments were continued in the summer crop in the Benger Swamp. Through the courtesy of Mr. C. L. Clarke, a portion of his land was used for these trials. The land was of an average type of Benger swamp, which is flooded and remains under water every year during the winter months. This periodic flooding apparently tends to maintain such land in a comparatively high condition of fertility by reason of the deposit of silt in addition to decayed swamp vegetation as the flood waters subside.

The plots were each 1/100th of an acre, and each manurial treatment was repeated six times. The separate plots were arranged in a chequerboard fashion, so that no two plots with the same manurial treatment were together. All the plots received the same treatment in their cultivation, and the manure was applied in the furrow at planting time.

Proper care was taken in the selection and in the pre-planting treatment of the potatoes used in this trial to ensure, as far as possible, that all the plots were planted with the same type of seed of the same degree of maturity. The seed was selected at the time of digging from the previous fertiliser trial at Burekup, which had been planted with "Delaware" potates, obtained from Mr. Fred Tonkin, of Young's Siding, from an 18-ton crop. For a period of two months these potatoes were exposed on wire racks under shade in the open. This was done to "green" them thoroughly, and also to afford an opportunity of rejecting any that might have been affected with "storage" or other troubles. Before the potatoes had sprouted they were dipped in the warm formalin dip (which has been outlined in various issues of this Journal). The efficiency of this dip was proved by the resultant tubers being free from scab and rhizoctonia. Whole seed at the rate of approximately 10 cwts. per acre was used in this trial.

An experiment was also conducted, using cut sets, three plots being planted with sets straight "off knife," and three plots with "sets" cut into a wet bag for a period of 24 hours before planting. In a series of experiments, it has been shown that the treatment of cut sets by the "wet bag" method tends to increase the yield.

The land at Benger at planting time is generally inclined to be wet, and consequently cut sets planted straight off the knife may do very well. As a matter of fact, there are many growers who are of the opinion that "wet bagging" is not necessary when the ground is wet at planting time. However, when freshly cut surfaces of the potato are exposed to the soil, there is danger of the leaching out of the sap, and the entry of bacterial or fungoid disease organisms into the "set." This, of course, must tend to

lessen the yield of the subsequent crop. The formation of the protective covering (suberin) over the cut surface when "wet bagged" practically removes this possibility. The table below is a summary of the results obtained:—

Treatment.	Average germination per plot.	Average yield per acre.	Percentage yield.
		tons cwt. qrs. lbs.	%
Wet bag	96	5 17 3 12	103
Off knife	95	5 14 1 4	100

From these results it is noted that there was a slightly higher germination and a greater yield in the plots planted with the treated sets. Though this difference in return is not so large as was the case in some of the former experiments, yet even this is worth taking into consideration. At the ruling price this season, an increase of 3 cwt. per acre represents a cash value of from £2 15s. to £3 per acre, a return which more than repays the very slight extra cost of labour entailed.

The land was in good condition for planting, although rather wetter than usual by reason of the slow evaporation of the flood waters this year. It was ploughed to a depth of 6 inches, and the sets were planted at a uniform depth of 4 inches. Planting was done on January 23. In Benger Swamp little or no subsequent cultivation is carried out, but the plots were twice harrowed, after planting and again about 14 days later. The weather during the growing period was very dry, a factor which must have influenced the yields on the various plots, and tended to minimise the effect of the various mixtures. Rain fell about three weeks prior to digging, but too late to make any material difference in the yields of the plots.

Another factor which influenced the yield was a heavy invasion of cutworms, and the damage was so severe on certain plots that the results obtained from them were not recorded. The plots were treated with a bait, which consisted of 1lb. of Paris green, 30lbs. of bran, and 4lbs. of treacle per acre, and since the invasion was heavy, it would have been profitable to have baited a second time about 10 days subsequent to the first baiting. Probably a sounder system would be to bait just prior to the emergence of the plants. The crop was dug on May 14th and 15th.

In the various trials conducted by the Potato Branch, it has been found tha the "control" mixture has been a very succesful fertiliser. This mixture consists of 1,430 lbs. of Superphosphate, 210 lbs. of Sulphate of Potash and 500 lbs. Sulphate of Ammonia, or approximately 14 cwt. of Superphosphate, 2 cwt. Sulphate of Potash and 5cwt. of Sulphate of Ammonia; in fact, the highest yield per plot (7 tons 15 cwt. 1 qr. 12lbs.), was obtained from one of the "control" plots, and throughout the Potato Fertiliser Trials the results from this mixture have been consistently good.

In the Sulphate of Ammonia Trials, a slight decrease in yield was noted when the quantity of sulphate of ammonia was decreased below that of the

"control" (500lbs. per acre). The table given below shows the results obtained:—

Manuring of Sulphate of Ammonia in lbs. per acre.	Amount of Nitrogen in lbs. per acre.	Average yield per acre.	Percentage yield.
		tons cwt. qrs. lbs.	%
350	70	6 5 0 0	94
500 (control)	100	6 13 0 4	100
200	40	6 7 2 20	96

A consideration of the superphosphate series would seem to show that there was no appreciable difference in yield derived from the application of 1,430 lbs. or 1,907 lbs. of superphosphate per acre. The results obtained are below:—

Manuring of Superphosphate in lbs. per acre.	Amount of Phosphoric Acid in lbs. per acre.	Average yield per acre.	Percentage yield.
		tons cwt. qrs. lbs.	%
1,668	350	6 18 1 16	99
1,430 (control)	300	7 1 0 8	100
1,907	400	7 1 0 8	100

It was interesting to note in the potash series that there was a slight difference in yield from the plots which received no potash in contrast with those with potash. No actual difference, however, was noted between an application of 210 lbs. and 415 lbs. per acre; this may have been due to the lack of rain during the growing season.

Manuring of Potash in lbs. per acre.	Amount of Potash in lbs. per acre.	Average yield per acre.	Percentage yield.
		tons cwt. qrs. lbs.	%
...	...	6 5 0 8	96
210	100	6 18 1 16	100
415	200	6 17 2 0	100

SUMMARY.

1. A good general fertiliser for potatoes in Benger Swamp is 14 cwt. Superphosphate, 5 cwt. Sulphate of Ammonia and 2 cwt. Sulphate of Potash per acre.

2. It is desirable to treat all cut seed by the "wet bag" method prior to planting.

3. Potash should be included in the manuring of potatoes.

4. In seasons when the cut worm is prevalent, it is desirable that the potato plot should be baited at least twice, preferably once before the emergence of the plants, followed by a further application 7 to 10 days later.

HERD TESTING.

THE OFFICIAL AUSTRALIAN PURE BRED DAIRY CATTLE PRODUCTION TESTING SCHEME.

Conducted by Dairy Branch, Department of Agriculture, Year ending 30th June, 1929.

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.		Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last day of Test.	Sire.
				Yrs.	Mths.			lbs.	%	lbs.	lbs.	
MATURE COWS—STANDARD 350 LBS. BUTTER FAT.												
Virginia 20th of Darbalara ...	W. G. Burges ...	M.S. ...	14858	5	1	20–9–28	273	10,401	4·41	459·54	12	Expert of Darbalara, 1608
Tipperary Mona	do.	Ayrshire ...	6165	9	2	20–8–28	273	10,077	4·46	450·16	19	Loudon of Oakbank, 2553
Starbrights Duchess of Glen Iris...	Mrs. B. Burnside	Jersey ...	14176	5	0	26·9–28	273	7,759	5·63	436·83	16½	Sweetbread's Duke of Glen Iris, 1918
Royal's Lamelie of Wangara ...	W. G. Burges ...	M.S. ...	14560	5	1	5–8–28	273	9,775	4·26	417·21	18½	Royal of Arrawatta, 555
Carnation 3rd of Greyleigh	E. McManus ...	do. ...	Vol. 8	6	7	2–8–28	273	11,820	3·40	402·52	20	Foch of Greyleigh
Yarraview Bonnie	A. W. Padbury ...	Guernsey...	781	8	2	8–9–28	273	7,047	5·61	395·49	19	Yarraview Glory De Joia, 218
Lily of Roelands	G. F. Coombs ...	Jersey ...	10619	7	11	23–7–28	273	8,122	4·63	376·15	7½	Bull Oak of Tarnfirr, 1887
Gladness 2nd of Wollongbar...	Dept. of Agriculture	Guernsey...	631	6	10	5–3–28	273	6,339	5·70	361·80	13	Faithful Fido of Wollongbar, 81
Topsy Rye of Grass Vale ...	C. H. Ironmonger ...	Jersey ...	15702	5	1	21–7–28	273	6,365	5·60	356·76	11½	Rye Duke of Glen Iris, 1994
Colleen of Rosewood	Dept. of Agriculture	Guernsey...	819	6	9	11–10–28	273	6,471	5·20	337·05	12	Archer of Nundorah, 76
Clare 2nd of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	7	0	25 9–27	273	8,304	3·98	330·50	13	Morven York Rose, 5th
Makanora of Grass Vale ...	C. H. Ironmonger...	Jersey ...	12257	5	11	26–5–28	273	6,369	4·97	317·09	18	Makarini, 995
Velvet of Wollongbar	Dept. of Agriculture	Guernsey...	774	7	5	9–10–27	273	7,704	4·08	314·50	18	Faithful Fido of Wollongbar, 81
Golden Pearl 4th of Wollongbar	Dept. of Agriculture	do. ...	863	5	11	1–2–28	240	5,970	5·22	311·85	17	Judge of Wollongbar, 184
Aberbechan Rosebud	E. V. Pailthorpe ...	Red Poll ...	1096AA	5	4	17–4–28	210	7,170	4·17	298·95	30	Basildon Redmond, 224AA
Bonnet II. of Berry	W. G. Burges ...	M.S. ...	13168	5	4	11–1–28	273	6,603	4·48	295·17	21	Newhaven of Darbalara, 1174
Minnamurra Holly	Muresk Agricultural College	Guernsey...	953	5	4	7–5–28	273	6,501	4·39	285·30	17	Minnamurra's Favourite Prince, 294
Parson's Red Rose 31st of Wollongbar	Dept. of Agriculture	do. ...	985	5	3	1–3–28	273	5,530	5·13	283·75	18½	Rose Boy of Wollongbar, 316
Aberbechan Molly	E. V. Pailthorpe ...	Red Poll ...	1090AA	5	3	29–4–28	210	7,440	3·79	282·27	33	Basildon Redmond, 224AA
Virginia 18th of Darbalara ...	W. G. Burges ...	M.S. ...	14857	5	4	7–2–28	273	6,342	4·37	277·28	19	Windsor of Darbalara, 1444
Virginia of Nundorah	Dept. of Agriculture	Guernsey...	778	7	0	6–10–27	273	5,373	4·89	263·14	11	Warrior of Nundorah, 322
Dinah 2nd of Wollongbar ...	do.	do. ...	832	5	1	29–3–28	273	5,676	4·54	257·96	12	Judge of Wollongbar, 184
Aberbechan Cherry	E. V. Pailthorpe ...	Red Poll ...	1088AA	5	4	3–7–28	150	6,690	3·82	255·96	41	Basildon Redmond, 224AA
Morden Lady 2nd of Koojan ...	A. W. Padbury ...	Guernsey ...	918	5	2	25–10–27	273	4,677	5·09	238·42	4	Gay Lad's Golden Dawn of Guild ford,
Virginia of Nundorah	Dept. of Agriculture	do. ...	778	7	11	25–9–28	273	4,983	4·39	218·85	11	Warrior of Nundorah
Pretty Polly II. of Cowra ...	W. G. Burges ...	M.S. ...	14414	5	5	8 1–28	210	4,590	4·47	205·16	16	Newhaven of Darbalara, 1174
Golden Cream 3rd of Roelands	Mrs. B. Burnside ...	Jersey ...	15690	5	2	14–8–28	240	3,135	5·98	187·71	6	Brown Fern of Glen Iris, 1364
Jean II. of Grass Vale ...	G. F. Coombs ...	do. ...	9996	7	8	6–5–28	150	2,730	5·80	158·34	13½	Noble Fondant of Garden Hill, 2268

COWS OVER 4½ YEARS AND UNDER 5 YEARS—STANDARD 325 LBS. BUTTER FAT.

Aberbechan Rosemary 3rd ...	V. D. Pailthorpe ...	Red Pole...	1098AA	4	10	25-4-28	273	9,294	4·23	393·40	28	Basildon Redmond, 224 AA
Koojan Rosebud	A. W. Wilson ...	Guernsey...	1260	4	8	29-5-28	273	6,846	5·02	343·81	17	Robin of Nundorah, 417
Cream Duchess of Grass Vale ...	G. F. Coombs ...	Jersey ...	17531	4	9	3-7 28	273	5,818	5·48	319·30	4½	Rye Duke of Glen Iris, 1994
Baronia Rye of Grass Vale ...	C. H. Ironmonger ...	do. ...	17529	4	8	26-4-28	273	6,630	4·72	312·88	20	Rye Duke of Glen Iris, 1994
Aberbechan Mary	V. D. Pailthorpe ...	Red Pole...	1358AA	4	9	19-4-28	210	8,055	3·49	281·61	36	Basildon Redmond, 224 AA
Priscilla 10th of Darbalara ...	W. G. Burges ...	M.S. ...	14457	4	11	14 9 28	273	6,076	4·38	266·11	5½	Melbourne of Darbalara, 1142
Wollongbar Realm 2nd ...	Muresk College ...	Guernsey...	1151	4	7	16-6-28	273	4,449	4·74	211·10	8	Bellman of Wollongbar, 334
Jean Rye of Grass Vale ...	C. H. Ironmonger	Jersey ...	15691	4	11	30-7-28	150	3,690	4·23	156·33	19	Rye Duke of Glen Iris, 1994

COWS OVER 4 YEARS AND UNDER 4½ YEARS- STANDARD 300 LBS. BUTTER FAT.

Matilda 7th of Berry	W. G. Burges ...	M.S. ...	14074	4	3	2 4-28	273	9,825	4·36	428·32	30	Rutland of Darbalara, 575
Dahlia 5th of Berry	do.	do. ...	Vol. 8	4	1	21-3 28	273	7,689	4·23	325·64	8	Mirth of Berry, 1716
Daisy Bell of Koojan ...	A. W. Wilson ...	Guernsey...	824	4	5	22-11-27	273	5,802	5·42	314·86	14	Gay Lad's Golden Rule, 247
Golden Rye of Grass Vale ...	R. H. Rose ...	Jersey ...	18566	4	1	15 9-28	273	5,184	5·82	302·07	8	Rye Duke of Glen Iris, 1994
Dover 5th of Kelvin Park ..	Hospital for Insane Claremont	M.S. ...	Vol. 8	4	1	9-11 27	273	6,189	4·49	278·29	8	Daddy Xmas of Croobyar, 928
Wollongbar Dessie 2nd ...	Muresk Agricultural College	Guernesy...	1121	4	1	9-5-28	273	4,969	5·20	258·62	11½	Renown of Wollongbar, 415
Koojan Lady Beatrice ...	Dept. of Agriculture	do. ...	1258	4	3	3-9 28	273	5,109	4·83	247·16	8	Robin of Nundorah, 417
Wollongbar Modesty 2nd ...	Muresk Agricultural College	do. ...	1134	4	5	10-7-28	273	4,320	5·06	218·70	10	Bounty of Wollongbar, 336
Koojan Bonnie Princess ...	Dept. of Agriculture	do. ...	1251	4	1	28 6-28	210	3,030	5·73	173·88	7	Golden King of Koojan, 369

COWS OVER 3½ YEARS AND UNDER 4 YEARS—STANDARD 275 LBS. BUTTER FAT.

Maggie Rye of Grass Vale ...	R. H. Rose ...	Jersey ...	19113	3	7	15 5-28	273	6,924	5·37	372·11	13	Rye Duke of Glen Iris, 1994
Rose 18th of Darbalara ...	W. G. Burges ...	M.S. ...	NYA	3	7	7-4-28	273	7,680	4·42	339·67	20	Victor of Darbalara, 2384
Koojan Dulcie	A. W. Padbury ...	Guernsey...	1255	3	9	13-1-28	273	5,705	5·68	324·06	18½	Robin of Nundorah, 417
Jessie Lind of Grass Vale ...	Dr. B. Burnside ...	Jersey ...	17965	3	10	27-3-28	273	4,420	5·90	260·99	13½	Rye Duke of Glen Iris, 1994
Spurfield Air Girl 2nd ...	Muresk Agricultural College	Guernsey...	1048	3	7	19-11-27	273	4,023	5·31	213·86	16	Milton's Stedfast, 292
Noreen 3rd of Garden Hill ...	W. Padbury ...	Jersey ...	17952	3	7	7-4-28	273	3,500	5·38	188·59	11½	Reformer of Garden Hill, 2732
Spurfield Angelica 2nd ...	Muresk Agricultural College	Guernsey...	1051	3	7	26 6-28	273	3,253	5·37	174·97	9½	Milton's Stedfast, 292

COWS OVER 3 YEARS AND UNDER 3½ YEARS—STANDARD 250 LBS. BUTTER FAT.

Melba 69th of Darbalara ...	W. G. Burges ...	M.S. ...	Vol. 8	3	5	19 4-28	273	8,679	4·56	395·83	23	ReEcho of Darbalara, 2254
Koojan Lady Buller	A. W. Wilson ...	Guernsey ...	1259	3	2	19-9-28	273	6,009	5·85	351·88	18	Robin of Nundorah, 417
Denmark Anne	Dept. of Agriculture	do. ...	1164	3	4	2-7-28	273	6,648	5·16	342·97	16	Linwood of Wollongbar, 381
Golden Rye of Grass Vale ...	R. H. Rose ...	Jersey ...	18566	3	2	21 10 27	273	5,359	6·05	324·34	6½	Rye Duke of Glen Iris, 1994
May of Wooroloo	Sanatorium Farm ...	M.S. ...	Vol. 8	3	0	31-8-28	273	6,064	4·35	263·87	16½	Commercial of Blackheath, 2001
Tessie of Garden Hill ...	W. Padbury ...	Jersey ...	17957	3	5	25-3-28	273	4,309	5·97	257·38	11½	Cream Socks of Glen Iris, 1410
Wollongbar Bonnie Pearl ...	Dept. of Agriculture	Guernsey...	1165	3	5	23-11 27	273	4,720	5·40	255·03	18½	Bounty of Wollongbar, 336
Spurfield Alma	Muresk Agricultural College	do. ...	1049	3	5	4-4-28	273	4,450	4·82	214·89	13½	Milton's Steadfast, 292

HERD TESTING—*continued.*

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.	Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last day of Test.	Sire.
				Yrs. Mths.			lbs.	%	lbs.	lbs.	
HEIFERS OVER 2½ YEARS AND UNDER 3 YEARS—STANDARD 225 LBS. BUTTER FAT.											
Yes of Woodlands	A. W. Wilson ...	Guernsey...	...	2 7	22-2-28	273	9,024	4·28	386·63	28	Renown of Koojan, 414
Lady Fowler 3rd of Grass Vale	R. H. Rose ...	Jersey ...	19111	2 8	4-2 28	273	6,349	5·82	369·59	21½	Rye Duke of Glen Iris, 1994
Brookvale Noble Lass ...	G. F. Coombs ...	do. ...	20866	2 11	2-7 28	240	3,915	5·97	233·76	5	Noble Lad of Roelands, 3707
Stella 3rd of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	2 6	9-7-28	273	6,762	3·44	232·73	19	Searchlight of Sunnyvale
Biddy 5th of Claremont ...	do. ...	do. ...	Vol 8	2 11	4-12-27	273	5,403	4·24	229·01	16	Telyarup Prince of Claremont, 2352
Silvermine 2nd of Garden Hill	W. Padbury ...	Jersey ...	20879	2 11	16-9-28	273	3,544	5·57	197·79	6½	Cream Socks of Glen Iris, 1410
Snowflake of Tipperary ...	W. G. Burges ...	M.S. ...	Vol. 8	2 6	21-2-28	273	3,382	4·30	145·64	7½	Express of Darbalara
HEIFERS UNDER 2½ YEARS—STANDARD 200 LBS. BUTTER FAT.											
Koojan Morden Lady 4th ...	A. W. Padbury ...	Guernsey...	1901	1 10	27-7 28	273	5,754	5·90	340·03	18	Robin of Nundorah, 417
Lady Fowler 4th of Grass Vale	R. H. Rose ...	Jersey ...	23690	2 3	26 10-27	273	5,437	5·81	315·92	17½	Starbrights Sweet Duke of Glen Iris, 3710
Koojan Wavelet	A. W. Padbury ...	Guernsey...	1619	2 0	16-8-28	273	5,823	5·34	311·96	21	Robin of Nundorah, 417
Koojan Rose	do.	do. ...	1617	2 4	25-8-28	273	5,280	5·85	308·12	15	Koojan Golden Governor, 595
Cranfock Lady Lily	Mrs. Burnside ...	Jersey ...	NYA	1 7	11-6 28	273	5,236	5·83	305·55	15½	Starbright's Sweet Duke of Glen Iris, 3710
Koojan Dorothy	A. W. Padbury ...	Guernsey...	1613	2 2	31-8-28	273	5,550	5·43	301·30	20	Koojan Golden Governor, 595
Carnation of Minnathorpe ...	E. McManus ...	M.S. ...	Vol. 8	2 1	11-6-28	273	6,523	4·50	294·02	19½	Bruce of Sunnyvale
Brookvale Noble Queen ...	G. F. Coombs ...	Jersey ...	NYA	2 2	17-8-28	273	5,460	5·35	292·53	10	Noble Lad of Roelands, 3707
Maggie of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	2 5	30 8-28	273	7,555	3·72	281·16	18½	Searchlight of Sunnyvale
Wing Wing of Wooroloo ...	Sanatorium Farm ...	do. ...	...	2 1	28-7 28	273	6,793	4·03	274·16	19½	Eclipse of Wooroloo
Golden Cream 2nd of Grass Vale	R. H. Rose ...	Jersey ...	NYA	2 5	21-9-28	273	4,851	5·63	273·29	12	Rye Duke of Glen Iris, 1994
Mabel 2nd of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	2 3	31-8 28	273	6,132	4·32	264·94	19	Telyarup Prince of Claremont, 2352
Koojan Colleen	A. W. Wilson ...	Guernsey...	1293	2 2	16-10 27	273	5,418	4·75	257·51	16	Robin of Nundorah, 417
Denmark Rosa	Dept. of Agriculture	do. ...	1429	2 3	3 3-28	273	5,019	5·12	257·27	18	Rose Chief of Wollongbar, 130
Koojan Iris	A. W. Padbury ...	do. ...	1614	1 11	10 7-28	273	4,060	6·20	251·98	13½	Robin of Nundorah, 417
Cocky 5th of Claremont ..	Hospital for Insane	M.S. ...	Vol. 8	2 3	19-3-28	273	6,619	3·78	250·51	16½	Telyarup Prince of Claremont, 2352
Pessie 2nd of Claremont ...	do.	do. ...	Vol. 8	2 3	20-3 28	273	6,118	3·98	244·02	19½	Rocket of Glenburn
Lady Mints Gem 8th of Garden Hill	W. Padbury ...	Jersey ...	20877	2 2	13-1-28	273	4,417	5·51	243·49	12½	Financier of Garden Hill, 4013
Kathleen 5th of Kurrawong ...	W. G. Burges ...	M.S. ...	Vol. 8	2 2	20-2 28	273	6,391	3·77	241·45	20½	Premier of Kurrawong, 1212
Flynn 7th of Claremont ...	Hospital for Insane	do. ...	Vol. 8	2 3	17-12-27	273	5,640	4·17	235·45	10	Telyarup Prince of Claremont, 2352
Blanche 5th of Minnathorpe ...	E. McManus ...	do. ...	Vol. 8	2 2	13-7-28	273	6,183	3·79	234·53	11	Collier of Darbalara, 1997
Spring Park Rye Queen ...	C. H. Ironmonger	Jersey ...	NYA	1 9	26-4 28	273	4,539	5·13	232·90	13	Rye Duke of Glen Iris, 1994
Brookvale Noble Lily ...	G. F. Coombs ...	do. ...	NYA	2 1	4 9-28	240	4,725	4·92	232·77	11	Noble Lad of Roelands, 3707

Rose of Wooroloo	Sanatorium Farm...	M.S. ...	Vol. 8	2	2	22–2–28	273	5,305	4·38	232·50	18½	Commercial of Blackheath, 2001
Sweet Duchess of Grass Vale ...	R. H. Rose ...	Jersey ...	23692	2	2	17–11–27	273	4.041	5·62	227·19	12	Starbrights Sweet Duke of Glen Iris, 3710
Hilda 2nd of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	2	5	10–9–28	273	5,889	3·74	220·44	18	Starlight of Sunnyvale Searchlight
Star Lady of Grass Vale ...	R. H. Rose ...	Jersey ...	NYA	2	2	5–10–28	273	4,221	5·22	220·32	12	Carnation's Masterpiece of Garden Hill, 2065
Dover 1st of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	2	3	6–9–28	273	5,152	4·26	219·45	12½	Rocket of Glenburn
Denmark Rose Velvet ...	Dept. of Agriculture	Guernsey ...	1431	2	0	10–10–27	273	3,813	5·70	217·59	11	Rose Chief of Wollongbar, 130
Mavis of Claremont	Hospital for Insane	M.S. ...	Vol. 8	2	3	3–3–28	273	6,007	3·58	215·51	17½	Telyarup Prince of Claremont, 2352
Brookvale Noble Girl	G. F. Coombs ...	Jersey ...	NYA	2	0	26–8–28	240	4,365	4·72	206·40	8	Noble Lad of Roelands, 3707
Biddy 6th of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	2	5	26–4 28	273	5,394	3·69	199·16	8	Telyarup Prince of Claremont 2352
Whitby Maid 5th of Claremont	do. do.	do. ...	Vol. 8	2	3	4 7–28	273	4,506	4·37	197·30	12	Searchlight of Sunnyvale
Tessie 2nd of Garden Hill ...	W. Padbury ...	Jersey ...	20880	2	1	14 12–27	273	2,869	6·64	190·53	11½	Cream Socks of Glen Iris, 1410
Blanche 6th of Claremont ...	Hospital for Insane	M.S. ...	Vol. 8	2	1	22–2–28	273	4,798	3·60	172·90	14½	Telyarup Prince of Claremont, 2352
Pride 4th of Kurrawong ...	W. G. Burges ...	do. ...	Vol. 8	2	2	31–1–28	273	4,887	3·52	172·33	14	Premier of Kurrawong, 1212
Ice Cream 2nd of Garden Hill	W. Padbury ...	Jersey ...	NYA	2	0	4–1–28	273	2,185	6·06	132·44	8½	Cream Socks of Glen Iris, 1410
Aberbeshan Rosemary 5th ...	E. V. Pailthorpe ...	Red Poll ...	1361AA	2	1	20–7–28	120	3,240	3·71	120·33	24½	Basildon Redmond, 224AA

FRUIT THINNING.

GEO. W. WICKENS,
Superintendent of Horticulture.

Undersized fruit, that is fruit which is much below the average normal size for the variety, is essentially poor in quality and plain in appearance, lacking juice and flavour, form and colour.

This is true of all kinds and varieties, but there are some fruits in cultivation where the difference between good grade and undersized means a difference in price representing a handsome return, compared with a dead loss.

At the auction rooms in Perth this month (August, 1929) good grade "Yates" apples, ranging in size from 2¼ inches to 2½ inches were sold for 14s. to 19s. per case, while in the same markets on the same days the same variety under 1½ inches were sold for 2s. per case, and though this latter price meant a loss to the growers it was a great deal more than the fruit was worth.

A similiar experience can be noted each year when the early stone fruits are marketed. "Newcastle" apricots, and peaches of the "Bell's November," "Edward VII." and "Dunhelm" class, largely grown in districts near Perth, are when undersized, almost unsaleable, the apricots being mostly stone, and the peaches' principle characteristics comprising a hairy skin and bitter flavour: but when these wretched specimens of some fruitgrower's lack of skill are being offered to buyers who refuse to be interested, the same varieties, grown to proper size by other growers, are subject to spirited bidding and realise high prices.

The varieties named are quoted as instances of some that suffer badly through allowing the trees to over-crop, but as stated above undersized fruit is poor fruit, irrespective of kind or variety, and the pity is that every season so much is in evidence when prevention is so easy.

If fruit trees are kept in a healthy condition of growth by attention to cultivation and manurial requirements of the soil, over-cropping is the only factor (apart from disease or drought) that will cause the fruit produced by those trees to be undersized, and the grower who has such fruit with difficult sales and low values has only himself to blame.

With deciduous trees, particularly those which have been bearing for a considerable number of years, winter pruning plays an important part in preventing overcropping. Fruit buds both on spurs and lateral growths should be reduced and spaced so as to prevent as far as possible the remaining buds from being crowded together: but no matter how carefully and well winter pruning is carried out it will be found in a normal season on a majority of trees thinning young fruits is essential before size and quality can be obtained. No loss in quantity need be feared from thinning if the work is properly carried out, for the lesser number of well grown fruits will fill as many cases as the greater number of undersized fruits. Another point also worth taking into consideration is the fact that thinning does not increase the year's work in the orchard: on the contrary it lessens it, for the fruits picked off in their early stages of growth are only handled

once, being thrown on the ground as soon as picked, but if left on the trees to mature they still have to be gathered and in addition packed in cases for market.

In thinning stone fruits—peaches, nectarines, apricots and plums—the operation should be delayed until after the natural shedding has taken place, which occurs according to variety from about the middle of October to the middle of November.

No hard and fast rule can be laid down as to the number to take off: the usual advice with peaches and apricots is to space the fruits about four inches apart, but trees rarely crop evenly enough to allow of this being made a rule, and the result aimed at should be to thin in such a way that each fruit is allowed sufficient room to develop to a good size for the variety without touching its neighbour.

Apples and pears grow in clusters, at times as many as five together, and as a general rule these should be thinned to two in each cluster, but the operator must exercise judgment according to whether the fruit buds are close together or a fair distance apart—for instance on aged "Yates" trees with fruit buds clustered on ramified spurs along the leaders, one apple to each bud is ample, and if spur pruning has been neglected in winter and buds are very close together every fruit should be removed from a number of them. The great art of thinning lies in even spacing of fruits, for half the apples could be picked off a tree and no good result be obtained if those remaining were clustered in bunches.

In thinning apples and pears, which as stated above grow in clusters, care must be taken when removing the fruits to leave the stems attached to the trees. If the stems are taken off with the fruits, the whole cluster is weakened, and the remaining fruits are liable to fall off at a later date. With practice it is comparatively easy to take hold of an apple and bend it upwards in such a way that the stem parts readily from the fruit, but this can be done only if thinning is being carried out when the fruits are still quite small, or are naturally long stemmed varieties. If they are short stemmed, like for instance, "Jonathans" and the apples in the cluster are tightly touching each other, it is nearly impossible to remove one with fingers without endangering the safety of those left behind. A small pair of scissors with blunt points makes a useful tool: a lemon clips is also satisfactory, or a sharp budding knife in skilful hands performs the work rapidly and well.

SUMMARY.

(a) Undersized fruit is poor in quality and appearance, and is either unsaleable or saleable only at prices that are non-remunerative:

(b.) Undersized fruit is mainly due to over-cropping.

(c.) Over-cropping can be prevented by reducing fruit buds in winter and thinning young fruits in early summer:

(d.) Efficient orchardists do not allow their trees to produce undersized fruit—inefficient orchardists should emulate their example—By their fruits ye shall know them.

CHAPMAN EXPERIMENT FARM.

JUNIOR FIELD TRIALS, 1928.

D. R. BATEMAN
(Seedsman.)

WHEAT VARIETIES.

The trials were planted on similar lines to those of previous years. Each variety was sown down two tubes of the drill, a drill width containing five varieties with the control variety Nabawa on either side.

The length of the plots as planted was 10 chains, this later being subdivided into 10 sections, each 87 links long with a division of 4 links between each section, the balance of the plot being left to form a headland.

Three of these sections were harvested for hay, six for grain and one was left standing, so that information regarding the strength of straw and ability of the different varieties to hold their grain could be obtained.

Seeding was carried out under ideal conditions on 19th May. Germination was excellent throughout the whole of the experiments.

Thirty-five varieties were included in the trial, 26 of these being apparently fixed cross-breds from the Merredin and Chapman Experiment Farms.

Of the remainder, there are seven from the Eastern States, which have shown promise here in the Test Rows, and two named cross-breds—Ogilvie and Bowes—bred at this farm. These latter two are midseason varieties of fair promise.

The results of the trials, as given in the following tables, are of use only as an indication of the possible comparative productivity of the different varieties. Every care is taken to keep the yields as accurate as possible, but the loss in threshing is too irregular for any definite yield per acre to be stated.

The area harvested per section of any one variety is approximately 1/640th of an acre, the total area per variety being:—6/640ths of an acre for grain and 3/640ths of an acre for hay.

The plots are harvested by hand, each section and variety being cut separately and the sheaf or sheaves labelled.

For hay the varieties are cut as near as possible at the same stage of maturity, and the sheaves stooked in the paddock until sufficiently dry for carting. Each sheaf is then weighed to the nearest ¼lb. and the weights recorded.

For grain the varieties are not cut until they would be fit for stripping. When cut the sheaves are stooked until it is convenient to thresh them by means of a small peg-drum thresher and winnower machine.

The yield of grain from each section is naturally very small and to get the results of the trial as accurate as possible, weights are taken to the nearest $\frac{1}{8}$th of an ounce.

RELATIVE YIELDS OF HAY AND GRAIN FOR 1927 AND 1928.

Reg. No. P.	Name of Variety or parent varieties of Cross-breds.	Maturity.	Average height, inches.	1928.		1927.	
				Grain.	Hay.	Grain.	Hay.
				%	%	%	%
M31	Gluyas Early x Nabawa ...	Midseason ...	45	125	136	...	...
1192	Ford	do. ...	50	116	155	135	144
M26	Nabawa x Carrabin ...	Early	42	111	127	...	...
1700	Alliance	do. ...	41	107	102	95	100
1614	Bena	Midseason ...	46	106	159	86	126
C84	D.A.C. 4179 x Nabawa ...	Early	46	103	109	...	...
1697	Ranee	do. ...	40	102	126	96	111
1463	Patriot	do. ...	43	101	123	100	132
1432	Nabawa—Control	Midseason ...	45	100	100	100	100
1804	Bowes	do. ...	45	100	113	88	126
1803	Ogilvie	do. ...	46	100	144	76	161
C76	Minister x Toby's Tusk ...	do. ...	45	100	147	...	...
M33	Florence x Nabawa ...	Very Early ...	44	98	124	...	...
M 3	Toby's Tusk x Nabawa ...	Midseason ...	44	95	105	120	142
1609	Nugget	do. ...	45	94	123	104	118
1696	Confederation	Early	40	94	105	111	131
M24	Florence x Carrabin ...	do. ...	43	94	115	...	...
C46	Minister x Toby's Tusk ...	Midseason ...	44	93	95	99	105
C77	Florence x Carrabin ...	Early	43	93	119	...	...
C51	Toby's Tusk x Gluyas Early	do. ...	41	92	122	117	132
C52	Nabawa x Gluyas Early ...	do. ...	42	90	125	118	132
C68	Currawa x Gluyas Early ...	Late	47	88	146	100	137
C47	Minister x Toby's Tusk ...	Midseason ...	45	88	104	81	100
M28	Dindiloa x Nabawa ...	Early	40	88	106	...	...
C59	Nabawa x Bunyip	do. ...	45	88	112	119	121
C69	Warren x Bayah	do. ...	43	88	87	116	112
C61	Federation x Bunyip ...	Late	43	85	81	99	118
M25	Nabawa x Carrabin ...	Early	42	85	86	...	...
C80	Dindiloa x Nabawa ...	do. ...	43	80	124	...	...
C56	Currawa x Cowra 15 ...	Late	42	79	117	123	126
M30	Dindiloa x Nabawa ...	Early	40	79	111	...	...
M4	Steinwedel x Cedar ...	do. ...	46	77	100	105	111
C86	Florence x Velvet Don ...	Late	46	76	157	...	...
C60	Nabawa x Bunyip	Midseason ...	42	75	67	119	132
C81	Florence x Nabawa ...	Early	46	71	82	...	...
M23	Federation x Carrabin ...	do. ...	42	68	78	...	...

BRIEF NOTES ON CHARACTERISTICS OF EACH VARIETY.

Alliance P. 1700.

Type:—White, square-tipped bald ear. Fairly short, stout straw that stands very well. Indifferent hay quality. Poor grain sample; dull, discoloured and slightly pinched.

Diseases:—Susceptible to Rust, Bunt, Septoria and Flag Smut.

Bena P. 1614.

Type:—Brown, slightly tapering, tip-awned ear. Stout straw that stands well. Indifferent quality hay. Has shed rather badly this season. Very good grain sample.

Diseases:—Susceptible to Bunt, Septoria, Rust and Flag Smut.

Bowes P. 1804.

Type:—White, tapering, tip-awned ear. Stout straw that stands well. Fair hay qualities. Sheds very little. Fairly good grain sample.

Diseases:—Susceptible to Bunt and Rust; moderately susceptible to Flag Smut.

Confederation P. 1696.

Type:—White, slightly clubbed, tip-awned ear. Stout straw that stands well. Indifferent hay qualities. Sheds rather badly. Unattractive grain sample, and a small percentage shrivelled.

Diseases:—Susceptible to Bunt and Rust. Fairly resistant to Flag Smut and Septoria.

Ford P. 1192.

A tall growing, dual purpose variety, that sheds very badly.

Type:—White, tapering, tip-awned ear. Tall, medium to stout straw, that stands fairly well. Yields well for hay, which is of good quality. Good for grain, but sheds badly.

Diseases:—Moderately susceptible to Rust and Septoria. Resistant to Flag Smut.

Nugget P. 1609.

Type:—White, square, slightly tip-awned ear, with rather a showy head, but very chaffy. Fairly tall, purple straw, that stands well. Fairly good for hay. Sheds badly.

Diseases.—Very susceptible to Bunt. Susceptible to Flag Smut and Rust. Moderately susceptible to Septoria.

A late variety that showed promise in the Test Row plantings, but failed under field conditions. Not worth continuing with..

Ogilvie P. 1803.

Type:—Brown, tapering, tip-awned ear. Fairly tall, stout straw that stands fairly well. Good quality hay. Sheds a little. Fairly good grain sample.

Diseases:—Moderately susceptible to Bunt, Septoria and Flag Smut. Susceptible to Rust.

Patriot P. 1463.

Type:—White, tapering bald ear. Fairly tall, medium straw. Fairly good hay qualities, but sheds badly.

Diseases:—Very susceptible to Bunt. Susceptible to Rust and moderately susceptible to Septoria and Flag Smut.

Ranee P. 1697.

Type:—Brown, tapering, tip-awned ear. Stout straw, that stands well. Indifferent quality hay. Sheds badly.

Diseases:—Moderately susceptible to Rust, Bunt, Septoria and Flag Smut.

C. 46 (*Minister x Toby's Tusk*).

Type:—White, tapering, tip-awned ear. Tall, stout straw, having fair hay qualities. Inclined to lodge badly. Sheds badly. Good grain sample.

Diseases:—Resistant to Bunt. Fairly resistant to Flag Smut. Moderately susceptible to Septoria and Rust.

Has not yielded up to expectations. Not worth continuing with.

C. 47 (*Minister x Toby's Tusk*).

Type:—White, slightly tapering, tip-awned ear. Tall medium straw, inclined to lodge badly. Sheds badly. Good grain sample.

Diseases:—Susceptible to Bunt and Flag Smut. Moderately susceptible to Rust.

Has not yielded up to expectations, and is not worth continuing with.

C. 51 (*Toby's Tusk x Gluyas Early*).

Type:—White, square tip-awned ear. Medium stout straw. Fairly good quality hay. Sheds very little. Good grain sample.

Diseases:—Very susceptible to Bunt. Moderately susceptible to Rust Septoria and Flag Smut.

A fairly promising variety. Consistent yielder for both hay and grain.

C. 52 (*Nabawa x Gluyas Early*).

Type:—Brown, tapering, tip-awned ear. Medium straw that stands very well. Good hay qualities. Does not shed. Good grain sample.

Diseases:—Very susceptible to Bunt. Susceptible to Flag Smut. Moderately susceptible to Septoria and Rust.

C. 56 (*Currawa x Cowra* 15).

Type:—White, clubbed, tip-awned ear. Fairly tall, stout straw that stands well. Indifferent hay qualities. Does not shed. Good grain sample.

Diseases:—Very susceptible to Bunt. Moderately susceptible to Septoria and Rust. Fairly resistant to Flag Smut.

A promising late variety that failed to yield up to expectations. Not worth continuing with.

C. 59 (*Nabawa x Bunyip*).

Type:—White, tapering ear, with short tip awn. Fairly tall, stout straw, inclined to lodge. Only fair hay qualities. Does not shed. Good grain sample.

Disease:—Fairly resistant to Bunt. Moderately susceptible to Rust and Septoria. Resistant to Flag Smut.

Similar type variety to Nabawa, but somewhat inferior. Not worth continuing with.

C. 60 (*Nabawa x Bunyip*).

Similar to C. 59, but does not yield as well. Not worth continuing with.

C. 61 (*Federation x Bunyip*).

Type:—Brown, tapering bald ear. Medium straw that stands well. Good quality hay. Sheds a little. Good grain sample.

Diseases.—Fairly resistant to Bunt, moderately susceptible to Septoria and Rust. Resistant to Flag Smut.

C. 68 (*Curawa x Gluyas Early*).

Type:—White, tapering, tip-awned ear. Tall medium to stout straw, that stands well. Good quality hay. Does not shed. Fair grain sample.

Diseases:—Very susceptible to Bunt. Slightly susceptible to Septoria. Moderately susceptible to Rust. Resistant to Flag Smut.

A good variety, that yields fairly well for grain.

C. 69 (*Warren x Bayah*).

Type:—White, square bald ear, rather compact. Straw medium stout, stands well. Fair hay qualities. Sheds a little. Nice grain sample.

Diseases:—Susceptible to Bunt, Rust and Flag Smut. Slightly susceptible to Septoria.

C. 76 (*Minister x Toby's Tusk*).

Type:—White, clubbed, partly bearded ear. Stout straw of indifferent hay qualities. Inclined to lodge badly. Fair grain yielder, inclined to shed. Good grain sample.

Diseases:—Fairly resistant to Bunt, susceptible to Rust and Flag Smut.

A tall growing variety that gave good promise in Test Row plantings. Not worth continuing with.

C. 77 (*Florence x Carrabin*).

Type:—White, tapering, bald ear. Medium stout straw, inclined to lodge. Good quality hay. Does not shed. Good grain sample for milling.

Diseases:—Resistant to Flag Smut and Bunt. Moderately susceptible to Septoria and Rust.

C. 80 (*Dindiloa x Nabawa*).

Type:—White, tapering, tip-awned ear. Medium stout straw that stands very well. Good quality hay. Does not shed. Fair grain sample. Hard to thresh.

Diseases:—Resistant to Bunt and Flag Smut. Slightly susceptible to Bunt and Septoria.

C. 81 (*Florence x Nabawa*).

Type:—White, tapering, tip-awned ear. Medium stout straw that stands very well. Good hay qualities. Does not shed. Good grain sample.

Diseases:—Fairly resistant to Bunt, Septoria and Rust. Resistant to Flag Smut.

C. 84 (*D.A.C.* 4179 *x Nabawa*).

Type:—White, tapering ear, similar to Nabawa. Tall stout straw that stands fairly well. Indifferent hay quality. Does not shed. Unattractive grain sample.

Diseases:—Very susceptible to Bunt. Moderately susceptible to Rust and Septoria. Resistant to Flag Smut.

C. 86 (*Florence x Velvet Don*).

Type:—White, tapering, tip-awned ear. Tall medium straw of good hay quality. Stands very well. Does not shed. Grain bright. Slightly shrivelled.

Diseases:—Resistant to Bunt and Flag Smut. Moderately susceptible to Rust and Septoria.

M. 3 (*Toby's Tusk x Nabawa*).

Type:—White, slightly clubbed, tip-awned ear. Tall straw. Inclined to lodge. Hay of fairly good quality. Sheds badly. Unattractive grain sample.

Diseases:—Moderately susceptible to Bunt and Rust. Resistant to Flag Smut.

A tall variety that yielded much better in 1927 than this season. Not worth continuing with. Very weak straw.

M. 4 (*Steinwedel x Cedar*).

Type:—White, clubbed, tip-awned ear. Fairly tall, stout straw that goes down badly. Does not shed. Fair grain sample.

Diseases:—Slightly susceptible to Rust and Septoria.

A fair dual purpose variety. Weak in the straw. Not worth continuing with.

M. 23 (*Federation x Carrabin*).

Type:—White, tapering bald ear. Medium straw that stands well. Fair hay qualities. Does not shed. Unattractive grain sample.

Diseases:—Fairly resistant to Bunt and Flag Smut. Moderately susceptible to Rust and Septoria.

An early variety that showed fair promise under Test Row conditions, but failed in field test.

M. 24 (*Florence x Carrabin*).

Type:—White, tapering bald ear. Medium straw, inclined to lodge a little. Fairly good hay qualities. Sheds badly. Attractive grain sample.

Diseases:—Fairly resistant to Bunt and Septoria. Moderately susceptible to Rust. Resistant to Flag Smut.

An early variety that showed promise under Test Row conditions and yielded well for both hay and grain, but shed badly.

M. 25 (*Nabawa x Carrabin*).

Type:—White, tapering bald ear. Medium straw that stands fairly well. Fair hay qualities. Sheds a little. Unattractive grain sample.

Diseases:—Fairly resistant to Bunt, Septoria and Rust. Resistant to Flag Smut.

M. 26 (*Nabawa x Carrabin*).

Type:—White, tapering bald ear. Medium straw that stands fairly well. Good hay quality. Sheds very little. Attractive grain sample.

Diseases:—Fairly resistant to Bunt, Septoria and Rust. Resistant to Flag Smut.

M. 28 (*Dindiloa x Nabawa*).

Type:—White, tapering, tip-awned ear. Medium to stout straw that stands well. Good quality hay. Does not shed. Attractive grain sample. Hard to thresh.

Diseases:—Resistant to Bunt and Flag Smut. Slightly susceptible to Rust and Septoria.

M. 30 (*Dindiloa x Nabawa*).

Type:—White, tapering, tip-awned ear. Medium to stout straw that stands fairly well. Fairly good hay qualities. Does not shed. Fair grain sample. Hard to thresh.

Diseases:—Resistant to Bunt and Flag Smut. Slightly susceptible to Septoria and Rust.

M. 31 (*Gluyas Early x Nabawa*).

Type:—White, tapering tip-awned ear. Stout straw that stands fairly well. Fairly good hay qualities. Does not shed. Fairly good grain sample.

Diseases:—Susceptible to Bunt, Rust, Septoria and Flag Smut.

M. 33 (*Florence x Nabawa*).

Type:—White, tapering tip-awned ear. Medium straw that stands fairly well. Good hay qualities. Does not shed. Very attractive grain sample.

Diseases:—Fairly resistant to Bunt, Rust and Septoria. Resistant to Flag Smut.

OAT VARIETIES.

In order to obtain more information as to the possibilities of a few oat varieties, which, up to the present, have not been tested here under field conditions, it was decided to test them in a Junior Field Trial, as is done with wheat varieties

The trial was planted on 24th May under ideal seeding conditions.

All varieties except C87, C90, and C95 germinated well on 2nd June.

All seed was pickled with a 1-450 formalin solution and as a result no loose smut was found throughout the test.

The varieties C87, C90 and C95 will be discarded, as they are of too late a maturity to be of use in this district.

The relative yields of hay and grain are as follow:—

Reg. No. P.	Name of Variety or parent varieties of Cross-breds.	Grain.	Hay.
1189	Mulga	124	100
1716	Palestine	104	59
1494	Burt's Early	100	100
C72	Algerian x Sunrise	89	89
1740	Belar	89	101
1522	Guyra	85	107
C 71	Burt's Early x Gartons	84	95
1724	Un-named	80	99
C 95	Algerian x Ruakura	63	55
C 90	Ligowa x Sunrise	55	49
C 87	Lachlan x Sunrise	47	38

Brief Notes on Characteristics of each variety.

C 87—*Lachlan x Sunrise.*—All late and useless varieties, not worth continuing with, as they as they have no value for hay, grain or early grazing.

C 89—*Ligowa x Sunrise.*—All late and useless varieties, not worth continuing with, as they as they have no value for hay, grain or early grazing.

C 90—*Algerian x Ruakura.*—All late and useless varieties, not worth continuing with, as they have no value for hay, grain or early grazing.

C 71—*Burt's Early x Garton's.*—Matures slightly later than Burt's Early. Useful variety for silage purposes, being tall and succulent. Stands fairly well; gives a good yield of grain, slightly plumper than Burt's Early. Sheds a little, and is susceptible to rust.

C 72—*Algerian x Sunrise.*—Very similar in growth to C 71. Yielded slightly better for grain. Stands fairly well; grain resembles Algerian in colour, but slightly shorter; susceptible to rust.

Belar—*P.* 1740.—This is a new strain of Glen Innes No. 5—P 1412—received from Cowra, New South Wales. Tall growing variety with fairly coarse straw. Hay not of good quality, but yields a good sample of grain, which threshes out well. Inclined to lodge in field trial this season; moderately susceptible to rust.

Guyra— P. 1522.—A tall growing grain oat. Rather coarse straw, which is inclined to lodge. Slightly later than Burt's Early. Inclined to shed its grain a little. Fairly plump grains, that are hard to part at threshing time; susceptible to rust.

Mulga—*P* 1189.—A heavy yielder of grain; slightly earlier than Burt's Early, but not nearly so valuable here either for early grazing or for hay purposes. Nice plump grain; sheds very little; susceptible to rust.

Palestine—*P.* 1716.—A short-strawed variety from Werribee, Victoria, which somewhat resembles Calcutta P. 469. Slightly earlier than Burt's Early. An excellent grain oat, but of no value for other purposes. Sheds its grain a little ; susceptible to rust.

Unnamed—*P.* 1724.—Received in 1925 for identification. Resembles Burt's Early a good deal, but has a slightly darker grain and is much weaker in the straw. Moderately susceptible to rust.

EXPERIMENTS FOR THE CONTROL OF EXANTHEMA IN JAPANESE PLUM TREES.

V. CAHILL, Orchard Supervisor.

As shown by Mr. W. M. Carne, late Botanist and Plant Pathologist to this Department, in an article in the issue of this Journal for March, 1926, Exanthema is a common disease of citrus in Western Australia. It occurs principally on light, gravelly soils with a stiff or gravelly subsoil, and is found more or less commonly throughout our orange-growing areas. Badly affected trees show typical die-back, and the fruit is discoloured or blotched with irregular brown markings of the skin which eventually becomes hard, dry and cracked.

Additional symptoms as described by Mr. Carne (loc. cit.) are as follow:—

1. The leaves on strong water shoots tend to become abnormally large and coarse, while the shoots have a tendency to droop outward and to grow upward at the end, forming an "S"-shaped curve.

2. Young shoots develop small blister-like swellings or gum-pockets, which if opened up will be found to contain a clear gum. Later, these gum-pockets develop into longitudinal ruptures edged with rough brown ridges, from within which gum exudes during wet weather.

3. Affected shoots tend to drop their leaves and to die back. The growth of laterals from the bases of the dead twigs produces a typically bunchy habit which is increased by the fact that growth-buds on affected trees frequently develop in clusters instead of twos, so that bunches of weak shoots subsequently arise.

A somewhat similar disease also identified by the Plant Pathologist's Branch as a form of Exanthema or Die-back has been found to be fairly common in the Darling Ranges on certain varieties of the Japanese Plum ("Satsuma" and "Santa Rosa"). It is largely confined to trees growing on gravelly soil with a stiff subsoil, and seems to be most frequent where the drainage is unsatisfactory. Trees growing on certain other soils are, however, subject to the disease to some extent.

In severe cases the pathological condition affects the terminal and sub-terminal branches as well as the trunk and larger limbs. Scaly bark appears on the young growth while the bark and wood of the older limbs are more severely affected. Splitting and scaling is the first sign and as the trouble increases the branches become much disfigured with dark, gummy, elongated fissures of the bark. These commence as longitudinal cracks which extend to the cambium layer. Later gum exudes from the ruptured tissues giving rise to a dark, rough, irregular, reddish-brown surface. Marked dying-back of the leaders on one side, or all around the tree is usually a very conspicuous feature of the disease. Although the cause of the trouble is not definitely known, it may possibly be that deficiency of organic matter in the soil is a contributing factor, as the soils where the condition occurs are very obviously deficient in humus.

Efforts made by the writer to work buds from an affected tree on to a healthy one, or to produce the disease by inoculation of sap or gum into the bark gave negative results. The buds did not take, presumably on account of their reduced vitality.

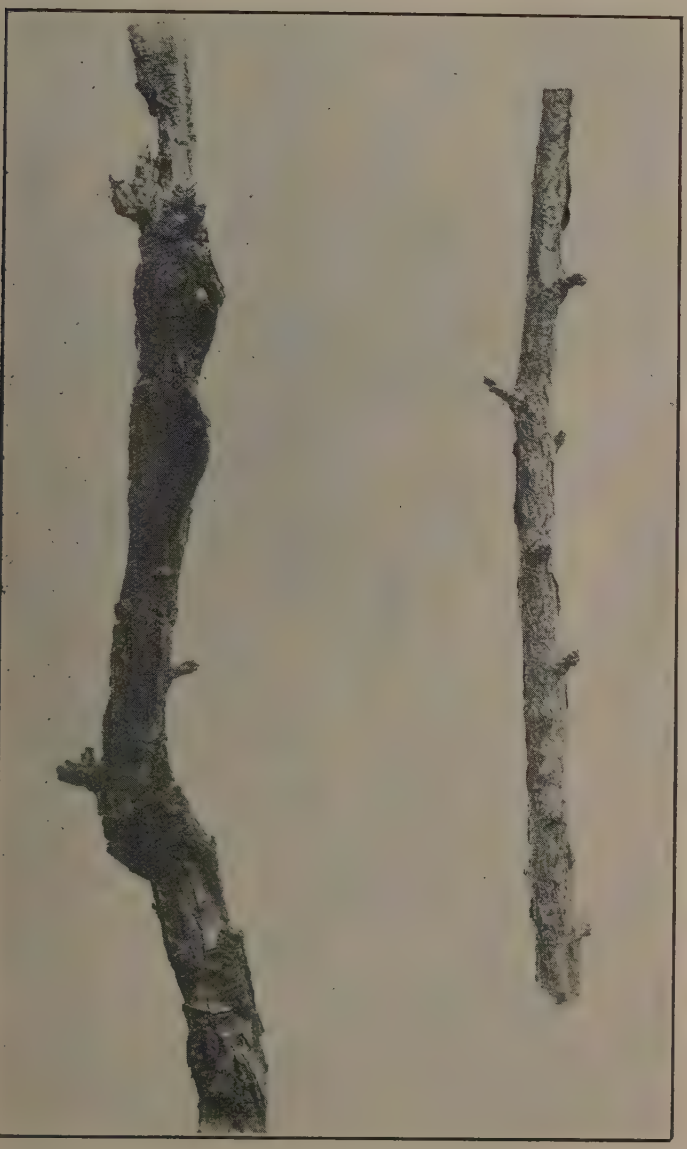


Fig. 1.

Exanthema on "Santa Rosa" plum showing bark eruptions.
Left: 3 years old. Right: 2 years old.

As the application of bluestone to the soil in the case of Citrus Exanthema had been found by Mr. Geo. W. Wickens, Superintendent of Horticulture, (1) to have a remedial effect it was decided to treat the plum trees in a similar manner, and during the winter of 1924 a number of "Santa Rosa" plum trees in the orchard of Messrs. Daniell Bros., Sawyer's Val-

Fig. 2.

Four-year old wood of "Santa Rosa" plum showing bark eruptions caused by Exanthema.

ley, were treated with an application of bluestone at the rate of 2½ lbs. per tree. The crushed crystals were spread on the ground beneath the trees and then worked into the soil. During the 1924-25 season the treated trees developed a good normal growth of stems and foliage, which has con-

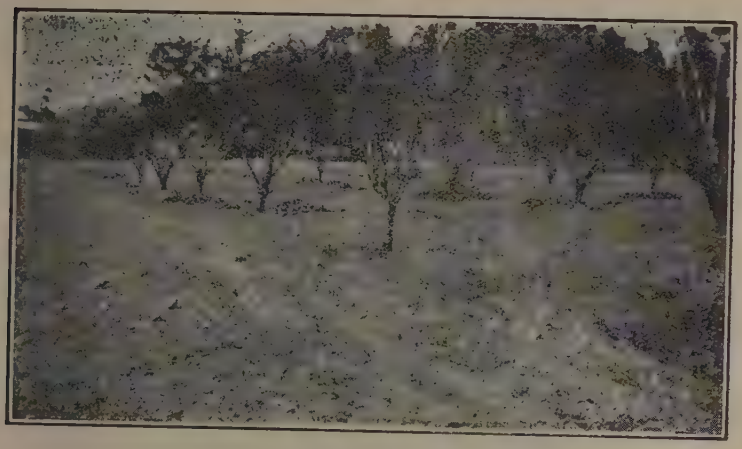


Fig. 3.
Ten year old "Santa Rosa" plum trees badly affected with Exanthema.

Fig. 4.
"Shiro" plum tree very badly affected with a type of Exanthema.

tinued for the last four years. All the remaining trees in the same orchard with the exception of twelve, were sprayed with Bordeaux Mixture 6-4-40 just before the bursting of flower- and leaf-buds, and again in the early Spring of both 1925 and 1926, after the fruit had set, with Bordeaux 4-4-40. This has proved to be an effective preventive. Fifty per cent. of the untreated trees developed the disease, but the treated ones remained quite healthy.

SUMMARY.

1. A form of the disease known on oranges and other citrus species, as Exanthema, also affects various varieties of Japanese Plum.

2. The disease can be identified by the occurrence of die-back, and the presence of hard, rough, irregular fissures in the bark, often more or less covered with a dirty reddish-brown gum.

Fig. 5.
Twelve year old "Santa Rosa" plum tree severely injured by Exanthema.

3. Gravelly soils over a stiff impermeable subsoil, and otherwise poorly drained soils are favourable for the development of the disease.

4. The cause of Exanthema is not definitely known, but the disease can be prevented by spraying with Bordeaux Mixture, or controlled, when once it has appeared, by the application of crushed bluestone to the soil at the rate of about 2½ lbs. per tree during the winter. This experience coincides with that of Smith and Thomas with Exanthema on stone, pome and other fruits in California (2) and McLeery (3) with various kinds of citrus in New South Wales.

Fig. 6.
"Santa Rosa" plum tree which has recovered after treatment with bluestone.

Literature Cited.

(1). Wickens, Geo. W., "Exanthema of Citrus Trees"—Report of Proceedings Imperial Botanical Conference, London, 1924, pp. 353—357.

(2). Smith, R. E., and Thomas, H. E.—"Copper Sulphate as a remedy for Exanthema on Prunes, Apples, Pears and Olives"—Phytopath. Vol. 18, pp. 449—454, 4 figs., 1928.

(3). McCleery, F. C.—"Exanthema of Citrus in New South Wales." Agric. Gaz. N.S.W. Vol. 40, pp. 397—406 and 523—533, 9 figs., 1929.

Fig. 7.

Tame magpie sitting on her nest in a young "Satsuma" plum tree in the orchard of Mrs. Davies, Sawyers' Valley.

THE NEED FOR LIME IN WESTERN AUSTRALIAN AGRICULTURE.

GEO. L. SUTTON, Director of Agriculture.

In the British Isles and in other countries with a wetter climate than obtains over the major portion of the agricultural areas of Western Australia there is a tendency for acidity to be promoted and for the soils to become sour. Under these conditions lime, because its principal use is to correct acidity, does play a very much more important part in British agriculture than in our agricultural areas, where, on account of the dry climate, there is a tendency for the soils to become alkaline rather than acid.

Though this is the case generally the Departmental Officers are not unmindful of the possible useful effect that lime may have on special areas, or on individual farms, and, in consequence, Departmental action is taken to determine on what soils, and under what conditions lime can be used to advantage. Since the appointment of the Plant Nutrition Officer (Dr. L. J. H. Teakle) this work is under his guidance, and he is conducting examinations of our soils with the object of classifying them into district types, and quite recently has found a soil in the Pingelly district which is so acid as to require a heavy dressing of lime to improve its fertility. Other cases have also been found in the potato districts indicating the possibility of an application of lime proving advantageous, and already arrangements are in hand to conduct experiments during the coming season to determine this matter.

It is known that in the Beverley district the question of the application of lime to the soil is one of special interest, and because of this, experiments were commenced at the Avondale Farm as soon as possible after taking it over. The results of the two years' trials show that the application of lime has not increased the yield. The wheat crops were sown in the usual way in May with 45 lbs. of seed and 100 lbs. of superphosphate. The percentage yields are as follow:—

	1928.	Average 1927–28.
Lime 10cwt. per acre...	99	95
No lime	100	100

At the request of a settler in the Tambellup district who was interested in this matter an experiment was carried out last year on his own farm, using in this case small quantities of lime and, of course, the usual application of superphosphate, 112 lbs. per acre. The results are as follow: Variety "Yandilla King." Rate of seed 45 lbs. per acre. Rate of superphosphate 112 lbs. per acre. Planted 30th April, 1929.

Plot No.	Applications of Lime per acre.	Computed Yield per acre.	
		bus.	lbs.
1	No lime	15	21
2	1½ cwt.	16	6
3	3 cwt.	17	47
4	No lime	21	6
5	1½ cwt.	22	13
6	3 cwt.	18	37
7	No lime	14	45

The question of the need of the soil for lime is also associated with the desirability of remedying any phosphorus deficiency with some form of basic phosphate. Experiments to determine this point have been carried out at the Avondale Farm using basic slag as the basic phosphate. These results are unfavourable to the basic form, thus affording further indication that the soils did not need lime. The average results for the last three years are:

Superphosphate	75 lbs.	18 Bus. 15 lbs.	100%
Basic Slag	97 lbs.	15 Bus. 3 lbs.	83%
Basic Slag	75 lbs.	14 Bus. 43 lbs.	81%

The same experiment carried out as a Farmers' Trial at Wagin last year gave similar results—

Superphosphate	75 lbs.	31 Bus. 30 lbs.	100%
Basic Slag	97 lbs.	29 Bus. 17 lbs.	93%
Basic Slag	75 lbs.	22 Bus. 30 lbs.	72%

In the Clover Belt, owing to the wetter climatic conditions, and consequent more acid condition of the soil, it was anticipated there would be a distinct need for lime or for basic phosphate. So far this has not proved to be generally the case. Two liming experiments conducted by the Dairy Branch on some low lying flats in the Denmark district showed only an initial temporary benefit for the first few months from the application of lime.

Because Thomas' Phosphate or basic slag is alkaline, and like lime helps to correct soil acidity, it was considered probable that this fertiliser would prove a more suitable source of phosphoric acid than superphosphate but contrary to expectations the results obtained from applications of basic slag did not prove superior to those obtained from the use of superphosphate. The results of the top-dressing experiments on Group Settlements in 1926 are as follows. The results obtained on the location of F. Hobbs in 1927 are also included—

		Super.		Basic Slag.		Basic Super.	
		tons.	%	tons.	%	tons.	%
1926—Locations of—							
— Burgoyne, Denmark	... (Hay)	1·14	100	1·00	93	·98	86
A. McPherson, Peel Estate	... (Green)	9·43	100	7·06	75	7·70	82
F. Hobbs. Manjimup ...	... (Green)	6·93	100	6·75	97	6·30	91
1927—Locations of—							
F. Hobbs, Manjimup ...	... (Green)	6·81	100	5·37	79	5·43	80

It is believed that the need for lime is rather local than general, and seeing that the lime content of our pastures is an excellent indicator in this connection, this view is supported by the results of an investigation into West Australian pastures by our Agricultural Adviser Underwood, who, in summing up states—"The lime content is high in all types of pastures sampled, except D1 and to a lesser extent F4. These are from untreated White-gum soils commonly reputed to be deficient in lime"; and "The energy values are rather lower and the fibre and lime contents higher than the British figures, but the outstanding differences lie in the phosphoric acid and protein percentages."

In connection with the relation between the lime content of soils and the application of superphosphate he also points out in the same thesis that Professor Perkins of South Australia obtained quite appreciable increases in the lime content of pastures from his plots top-dressed with superphosphate, whereas the pastures in the plots not top-dressed were very poorly supplied with lime.

Lime is also useful in controlling some, but not all, pests and diseases. Some diseases like "Finger and Toe" of the Turnip family find a condition of alkalinity unfavourable to their development, and, in consequence, an application of lime sufficiently heavy to correct acidity will prevent or inhibit them. The opposite position obtains with other diseases, as for instance, Potato Scab and Flag Smut, which are encouraged by a condition of alkalinity, such as is usually produced in dry climates, or by the application of lime.

The extent to which the quantity of Flag Smut is affected by the application of superphosphate and of lime has been brought out by investigations conducted at the Werribee Research Farm by Foster and Vasey. The results obtained in 1927-28 were—

THE RESULTS OF COUNTS MADE FOR FLAG SMUT INFECTION.

Manurial Treatment.	Percentage of Diseased Plants.	
	1927.	1928.
No manure	1·9	4·4
Superphosphate, 1cwt. average	1·8	3·8
Super. 1cwt. + Lime 20cwt.	13·2	11·3
Super. 1cwt. + Lime 10cwt.	13·4	14·4
Super. 1cwt. + Lime 5cwt.	7·6	10·9
Thomas' Phosphate 1cwt.	7·7	...

It will thus be seen that the effect of adding the usual light dressing of 10 cwt. lime per acre was to quadruple the extent of Flag Smut infection.

There are some farmers who believe that the continued application of superphosphate is likely to cause the soil to become more acidic as the result of the depletion of its lime contents. This phase of the lime question was discussed briefly in this Journal for June, 1928, and it was then pointed out that there was no foundation for such a belief—"Farmers in the Clover Belt and elsewhere may, therefore, continue using superphosphate without fear that their soils will become more acidic because of its continued use, and also with confidence that the calcium compounds in the superphosphate will furnish the calcium needed by the plant for a food."

POTATO DISEASES IN WESTERN AUSTRALIA.

(Continued.)

3.—IRISH OR LATE BLIGHT.*

(Caused by *Phytophthora infestans* (Mont.) de Bary.)

H. A. PITTMAN, B.Sc.(Agr.),
Plant Pathologist.

Although uncommon in Western Australia, "Irish Blight" is in many countries the most destructive disease of potatoes, as, in localities where warm, muggy conditions occur during the day and comparatively low temperatures at night, it may rapidly attain epidemic form, and, in the course of a few days, completely destroy the plants over large areas.

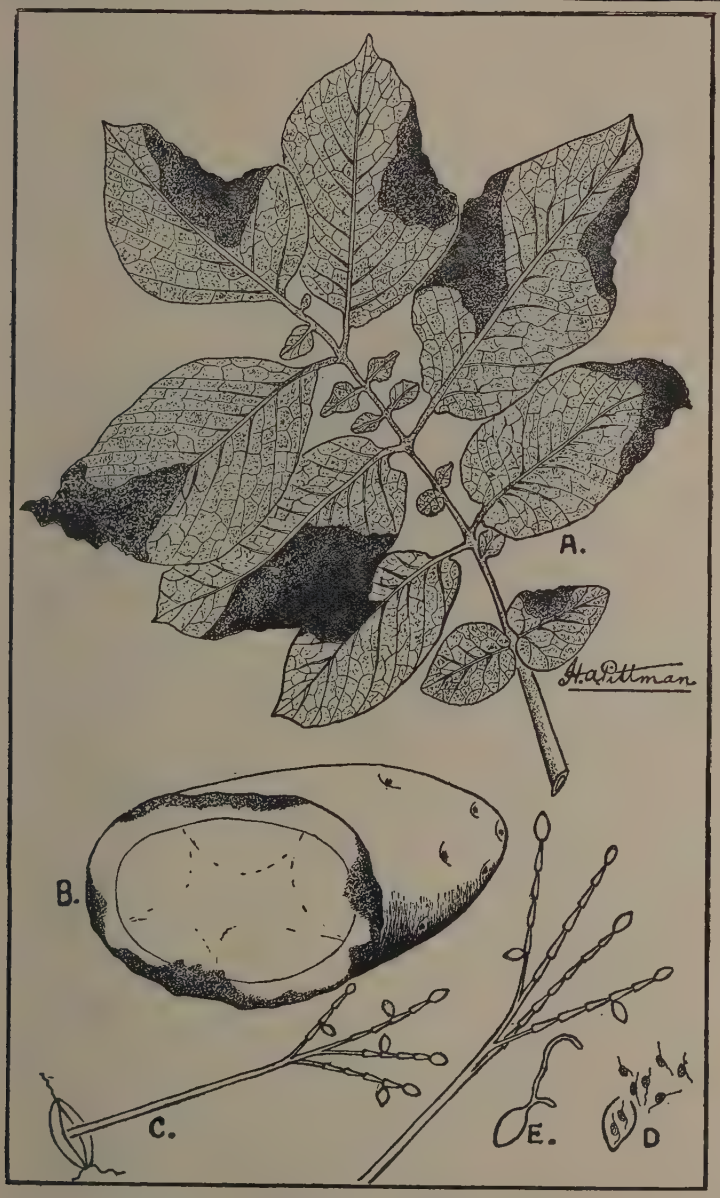
Phytophthora infestans, the fungus responsible for "Irish" or, as it is often called, "'Late' Blight," was apparently introduced almost simultaneously into Europe and North America between 1830 and 1840. By 1845 it had become widespread, and in that year it became so serious in Ireland that disastrous famines resulted from the wholesale destruction caused to the potato crops on which the poorer classes largely subsisted. Great numbers of people died of starvation, serious political disturbances ensued, and there commenced a great exodus of Irishmen from the Emerald Isle to the United States of America as a direct consequence of the resultant unhappy conditions.

Fortunately for the potato growers of Western Australia the climatic conditions here are only rarely such that "Irish Blight" need be feared. This is borne out by the fact that, although the disease is widely distributed in Western Australia, it has only been recorded by this Department on comparatively rare occasions during the twenty-one years since the disease was first officially recorded here (*i.e.*, in 1909). At no time during the history of this State does it appear to have assumed epidemic form. During September and October of 1928 the *Phytophthora* made its appearance at widely scattered points around the metropolitan and adjacent areas, but did comparatively little damage as the climatic complex necessary for its appearance in serious form was only intermittent in its occurrence, and soon passed away altogether.

SYMPTOMS.

Leaves, petioles, stems, blossom-stalks and tubers may be attacked. On the leaves, dead, brown or blackish more or less extensive, collapsed, water-soaked areas occur which usually commence near the margins of the leaves and rapidly work inwards. (See Fig. 1A.) If the weather conditions subsequently become hot and dry the dead areas may wither and dry up, but if humid conditions continue they may rapidly rot away with the evolution of a characteristic offensive odour. Infection usually first takes place on

* For diseases 1 and 2, Rhizoctonia Scab (due to *Rhizoctonia solani*), and Common Scab (due to *Actinomyces scabies*), see preceding issue of the "Journal" or Leaflet 72, second edition.



Explanation of Figures.

Fig. 1.—"Irish blight" of potatoes caused by *Phytophthora infestans.*
A, Potato leaf showing "Irish Blight."
B, Potato tuber showing the reddish-brown areas of dry-rot due to *Phytophthora infestans.*
C, Fruiting-branch of the fungus protruding from a breathing-pore in a potato leaf.
D, Formation of *zoospores* on germination of a *sporangium.*
E, Germination of spore under warm conditions by a germ-tube. (All parts of the fungus highly magnified.)

the lower leaves. In warm muggy weather the disease advances very rapidly, and the entire tops may soon become blackened and collapsed (see Fig. 3), followed by a wet rot involving the stems as well as the foliage. If affected leaves are examined after being placed in a moist jar overnight, or even after a cold night in the field, great quantities of delicate white mould may be found on the under surfaces and especially along the margins between the dead and healthy tissue. This is composed of the

Fig. 2.—"Irish Blight" on potato leaves.

spore-bearing bodies (*sporangiophores*) of the fungus which have grown out overnight through the *stomata* or breathing pores of the leaves. (See Fig. 1c.) The spores (*sporangia*) readily break away from the *sporangiophores,* and are carried in the dew or by wind or rain to the soil or neighbouring leaves or plants. On germination each *sporangium* produces a number of actively motile animal-like bodies called *zoospores,* which swim about in the moisture until in a favourable position to attack new areas.

(See Fig. 1D.) Each then settles down, forms a cell-wall about itself, and pushes out a thread or *hypha* which proceeds by growth to penetrate the host, and subsequently extend the disease.

Fig. 3.—Young potato plant affected with "Irish Blight."
After McAlpine.

Under high temperatures the *sporangium* may germinate directly by a germ-tube instead of forming *zoospores* (*i.e.*, it may function as a *conidium*. (See Fig. 1E.) The threads of the fungus grow about between the cells of the host and absorb food materials by means of absorbing structures, called *haustoria*. (See Fig. 4.) So great are the demands on the host that death of the cells rapidly follows.

Fig. 4.—Section of potato leaf showing fungus within leaf and also method of production of fruiting bodies and *zoospores* by the fungus. *After Scribner.*

The disease may prove disastrous in two ways. Firstly, if attack comes early in the season the yield of tubers may be greatly reduced on account of the killing of the leaves and stems. Secondly, very serious loss may result from direct attack on the tubers themselves. *Sporangia* may be washed down into the soil by rains and dews, and on germination the *zoospores* may bring about direct infection of the tubers. A *dry or wet rot* may result according to the moisture and temperature conditions in the soil at the time. Where the soil is heavy, damp and warm, complete disintegration of the tubers may speedily result. Under conditions less favourable

to the organism, the disorganisation and characteristic reddish-brown discolouration of the tissues may only occur to a depth of about ⅛in. to ¼in. (See Fig. 1B.) In such cases the diseased tubers remain comparatively firm, but the surface may be slightly sunken and become somewhat purplish-black in colour. This *dry-rot* condition may be evident on digging or may only become clearly apparent after some time in storage. Cool, well aerated, dry storage conditions materially check the dry-rot symptoms from further development, but if the conditions are damp, complete destruction of the whole stack may speedily follow. This is, of course, largely assisted by secondary organisms, which follow up the initial injuries caused by the *Phytophthora.*

Fig. 5.—Showing effect of Bordeaux mixture in preventing attack by Irish Blight. Plants on left and right sprayed with Bordeaux; those in centre not sprayed.

After Duggar.

The diease appears to be carried over from year to year by means of fungus-threads, which hibernate within affected tubers. When such tubers are planted the threads of the fungus (*mycelium*) grow up the developing shoots and, under favourable conditions, produce the *sporangia,* thus starting the disease in the new season's foliage. If the mean day temperatures lie between about 70° and 74° F., the humidity is high, and the night temperatures fall to about 50° F. the blight may speedily attain epidemic form.

CONTROL OF IRISH OR LATE BLIGHT.

As stated above Irish or Late Blight has never yet become a serious trouble in our potato-growing areas. Many years may pass without any sign whatever of the disease being present. Nevertheless, should the climatic conditions ever become favourable for the disease for a week or so on end great damage might result. The growers should, therefore, be pre-

pared to take action against the parasite should it make its appearance during warm muggy weather.

1. *The disease can be readily controlled by spraying with Bordeaux mixture* 4-4-50 *or* 5-5-50. (See Fig. 5.) Affected plants cannot of course be cured, but still healthy plants can be protected from attack. Care should be taken to apply the spray with as much force as possible, and particularly to the bottom sides of the leaves. If commercial Bordeaux is used, 1lb. should be used to 5 gallons of water. As the disease is of such rare occurrence here, preventive spraying each year and several times during each season, as is necessary in many other countries, is not justified, but in view of the havoc which the disease may occasion at short notice, all growers should be prepared.

2. If the tops become badly attacked towards the close of the season and dry weather follows the tubers should not be harvested till a week or more after the tops are dead, as the risk of extensive infection of the tubers, with subsequent rotting in storage, is then considerably reduced owing to the killing of the *sporangia* by the dry weather. Where only small areas are affected the tops should be cut away and burnt before the tubers are harvested.

3. If the tubers must be harvested shortly after attack, cutting away and burning the tops, combined with spraying of the soil with Bordeaux 4-4-50 before digging, will considerably reduce the percentage of affected tubers.

4. Care should be taken to keep the plants well hilled up, so as to prevent the *sporangia* readily reaching the tubers.

5. After digging the potatoes should be kept in a cool dry place to reduce the rotting in storage to a minimum. Tubers stored at 40° F. or lower only rot very slowly, even if fairly badly attacked. **Never, on any account, place the leaves or stems of potato plants in the tops of the bags.**

6. Potatoes from a diseased crop should not be used for seed unless no others are available. In this case any showing brown discolouration on cutting should be culled out from the seed tubers and destroyed by boiling.

LOCUST WARNING.

L. J. Newman,
Entomologist.

During the present season there has been evidence that this destructive pest is again on the increase. Given suitable climatic conditions, it is quite possible that in certain districts there will appear damaging swarms next August or September.

Farmers in the locust areas are, therefore, advised to take careful observation and note where the present minor swarms are depositing their eggs. Locusts lay their eggs in the ground. The favoured locations are bare, hard, non-grassy lands, such as roadsides, commonages and cleared uncultivated land.

If eggs are known to be present in such places, same should be ploughed and broken up, thus exposing them to the destructive effects of the elements, birds and predaceous insects.

Should any breeding grounds be missed, the young hoppers when found must be poisoned off before the winged stage is reached. For full details concerning the life history and treatment apply to the Department of Agriculture for Leaflet No. 142.

HORTICULTURAL NOTES.

Geo. W. Wickens
(Superintendent of Horticulture.)

Up to the time of writing—26th of August—weather conditions in the fruitgrowing areas of this State have been most favourable for the development of fruit buds on deciduous trees. There has been ample rain, interpersed with fine, sunny days, and some frosts which were not sufficiently severe to cause damage, but temperatures were low enough to ensure the trees becoming thoroughly dormant in winter.

Weeds and clover crops came away early, and in well drained soils were ready to be ploughed under before the end of August. Some of the older settlers are prophesying an early spring, and whether this is merely a guess or an opinion based on meteorological prescience, no risks should be taken with the moisture present in the soil; cross ploughing should be completed by the middle of September and the ground around all trees hoed or forked, and then in October cultivators should be kept moving to minimise the growth of weeds and retain soil moisture to carry the trees along should dry weather be experienced in early summer.

Following on last year's exceptionally heavy crop of apples, the fruit buds on aged trees are not too promising, particularly "Dunns," "Rokewoods," and "Jonathans." "Cleopatras" and "Yates," however, are showing well for an average crop, and "Granny Smith" for a medium one.

The above refers to the older trees; the younger ones are carrying fine plump fruit buds and the crop on these will be good unless something unforeseen occurs during blossoming or setting. The trees, particularly the old ones, will be assisted in setting fruit if a dressing of nitrogenous manure, sulphate of ammonia or nitrate of soda at the rate of 3cwts. per acre is applied to the soil about two weeks before the trees blossom. Nitrophoska No. 1—a fertiliser comparatively new to fruitgrowers in this State—is also worth trying, as it contains 17.5 per cent. nitrogen in addition to potash and phosphoric acid in water soluble form.

Though in the above, apples only are mentioned, an application of nitrogenous fertiliser applied in spring, as advised in Horticultural Notes published in the March issue of the "Journal," is helpful to fruit setting, both on citrus and deciduous trees.

Citrus trees in nearly all districts commenced blooming very early this season, probably a result of a long, dry summer, followed by heavy rains in May and June. Orange aphis also made an early start and requires attention wherever the insects are sufficiently numerous to materially damage the blossoms. Last spring and early summer, Orange Aphis did a great deal of harm to the orange crop, more particularly in orchards in the coastal area, where in some instances the trees entirely failed to set fruit, as a result of the depredations of the pest. Black leaf 40 and soap is a standard control spray, and can be safely used on the trees at blossoming time, but "Volek"—another spray comparatively new in Western Australia—which was tested by the department last season, gives very good results, being deadly to the aphis and non-injurious to the trees, while it has an added advantage in the ease with which it can be mixed. Apply for Orange Aphis at a strength of 1 in 65.

In the test mentioned, "Volek" applied at a strength of 1 in 50 in the month of January, was very effective in killing red, black and soft brown scales on citrus trees.

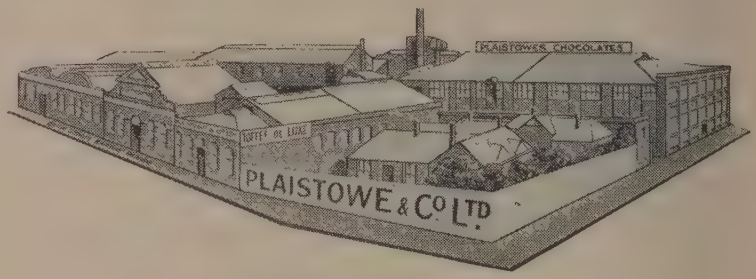
In the early part of last season Red Scale in citrus orchards got well ahead of the parasite, and in January and February it appeared that the fruit would be badly marked when ready for sale, but the experience of other seasons was again repeated, and before the oranges ripened the parasites had increased to such an extent, that scales both on fruit and trees had been reduced to negligible proportions. Western Australia is the only orange growing State in Australia where Red Scale is controlled by its natural parasite, and orchardists should take care to preserve the beneficial insect. There are undoubtedly seasons when the pest appears to have beaten this control, and be greatly in ascendancy, and at those times spraying or fumigation may be necessary, but should this occur, the artificial means of control should not be carried out through the entire orchard. Some infected trees should be left to carry on the parasites, for the experience gathered over a number of years shows that when we relied on sprays and fumigation to control Red Scale, the pest was much more in evidence than it is to-day.

During the months of October, November and December, fruit fly will become increasingly active as the weather becomes warmer, and the soft fruits ripen, and baiting, trapping, gathering fallen fruits, and destruction by boiling of all infected fruits is essential work that should not under any

circumstances be neglected. If all fruitgrowers, whether owners of broad acres, or occupiers of back yard gardens carried out this programme, as it should and could be carried out, fruit fly would soon cease to be a serious factor in the fruit industry of Western Australia. Instances can be quoted where baiting and destruction of infested fruit has held the pests under control, both when the baiting was done by a number of growers working together in a community effort, and also when the work was performed by individual growers. But the pest is virile and prolific, and no known method which assists in control should be neglected, so the advice is earnestly tendered to all growers in the infected portions of the State (fortunately, a large area still remains free) to bait once every seven days, to trap continuously, to gather fallen fruit daily and to boil all fruit found to be infected.

Red Mite (*Bryobia pratensis*), is another pest needing attention during the early summer months. In the past growers have depended mainly on oil sprays applied to the trees while dormant in winter, but though undoubtedly a great number of the eggs are destroyed in this way, there are always enough left to carry on the pest, and unless an early summer spraying is carried out when the mites become noticeable shortly after the fruit has set, they soon increase to such an extent that serious damage to the trees occurs.. "Volck" at a strength of 1 in 65 has proved very effective as a summer spray without injuring either fruit or foliage.

As a result of the campaign against Codlin Moth, the Collie outbreak has been entirely suppressed, and the Narrogin outbreak reduced to such an extent that only four larvae were found there during the whole of last season, But just as the pest found an entrance to the orchards in those centres, so it may at any time be introduced to other fruit growing districts, for it is prevalent in the Eastern States, and may be introduced in goods at any time. Every fruitgrower should take notice of any apple, pear or quince showing evidence of having been tunnelled by a caterpillar, and if he does not know the culprit, should at once communicate with the department. It is only this close co-operation of the growers with the department that has enabled steps to be taken which have resulted in Western Australian apple orchards being free from one of the worst pests of apple growers.



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POTATO CHIPS.

G. N. Lowe
(Senior Potato Inspector.)

Erratum.—Under the heading of "A probable cause of bad germination" in the June issue of this "Journal," the following appeared:—"Where no care had been exercised in placing the 'set' to see that the skin was not exposed to the fertiliser, the resulant damage was often so great as to practically wipe out the crop."

In place of "skin side," read "cut side," and the proper rendering is obtained. The context, however, showed the obvious mistake, but it is thought advisable that special attention should be called to it.

Certified Seed.

It is pleasing to be able to state that the record certification of seed has occurred in our Centenary Year, but it is confidently expected that this will be easily eclipsed next season from the indications at present.

Just over 5,000 bags have been sealed this season, with the demand for double the quantity unsatisfied. Just here, it is well to point out that growers who need supplies for next season, must be seized of the necessity of getting their orders in at least three months ahead of their expected planting period, to be at all sure of obtaining their requirements.

For the guidance of growers who plant in June and July in South-Western districts, it will be of use to know that the seed which is best suited to their planting is dug in the Albany-Denmark district in March and April.

In the case of growers situated at Osborne Park, Spearwood, Jandakot and Coogee, who do not plant until September and October (or growers similarly placed), seed dug in May and June from south-west swamps, or Albany-Denmark hills, is more desirable, being not too forward at planting.

With this knowledge, growers in the various districts, should make the necessary provision for their seed supplies well ahead, in order to avoid disappointment. The Potato Branch is always glad to give the necessary information as to where reliable seed may be obtained.

A factor which was responsible in no small measure for a considerably greater quantity of certified seed not being put through the scheme this season, was the high prices ruling at the time of digging.

Some few growers, particularly those who needed "the root of all evil," urgently at the time, decided to sell in old bags at £1 or so above market rates at digging, after having had their crops inspected under the Certified Seed Scheme. They used the fact that their crops had, so far, passed inspection, as a reason for extracting the extra money from their customers, but without being put to any expense themselves for final certification.

Viewed from the writer's standpoint, this is distinctly "not cricket," and in future, steps will be taken to ensure that where an application is made for certification, the applicant must "carry on" until such time as the officers of the Potato Inspection Branch advise him that his crop for one reason or another is not desirable.

Already, instances have been noted where such men, who, last season sold certified seed of very high standard, had direct repeat orders for this year, but supplied uncertified seed, declaring it "just as good," but failed to observe the same standard, with the result that this Branch has had complaints—why it is hard to fathom. Whilst officers endeavour to do everything possible to ensure certified seed being as near perfect as possible, they cannot be held in any way responsible in cases of this kind.

It does, however, demonstrate again—if demonstration be needed—the value of the certificate, and the Potato Branch may be forgiven if it harbours that un-Christian but perfectly natural spirit of "It serves you right." Moral—Insist on the certificate.

An instance of the extreme view on the other hand, is interesting. A Donnybrook grower obtained certification of sufficient of his own seed to plant his winter area, so that he might be able to state fairly that his crop was actually grown from certified seed, and a very excellent line the offering was.

The Way Potatoes Increase.

Last winter, Mr. "Bill" Fry, of Benger, who is a nephew of Sir James Mitchell, selected two extra large tubers from a bag of Certified Seed belonging to him and after cutting these into 42 sets, planted them under the usual conditions.

The return from these was 180lbs. of very fine potatoes. These were in January again planted in Benger Swamp, and yielded 13 bags, so that in two crops from two tubers nearly a ton of potatoes was obtained which once more emphasises the importance of "strain" in seed.

Counting the flock.

PHOSPHORUS, ITS HISTORY AND AGRICULTURAL IMPORTANCE.

B. L. Southern, A.A.C.I.

Phosphorus, the essential constituent of all phosphatic fertilisers, was first discovered by alchemist, Brand, of Hamburg, in 1669, but he kept his method of preparation secret. Robert Boyle, a celebrated English chemist and physicist, isolated the element in 1680. Until 1771 when Scheele prepared it from bones it was looked upon as a chemical curiosity.

In this, a popular science article, perhaps a glimpse into the complicated nature of our chief fertiliser will help the uninitiated to appreciate to a small degree, the recent investigations into the chemistry of what was once considered to be a simple compound.

Phosphorus occurs in nature, both in rocks and in bones, in the form of calcium fluophosphate and calcium hydroxyphosphate, represented by the chemical formulae $Ca_5F(PO_4)_3$ and $Ca_5(OH)(PO_4)_3$ respectively. These compounds have erroneously come to be referred to as tricalcium phosphate, a name dating back to the time when the presence of fluorine and hydroxyl (OH) in the natural compounds had not been recognised. The natural compounds contain the following elements:

	Fluophosphate.	Hydroxyphosphate.
Calcium, Ca	39.74%	39.90%
Fluorine, F	3.77	—
Hydrogen, H	—	.20
Oxygen, O	38.07	41 40
Phosphorus, P	18.42	18.50
	100.00	100.00

Freshly prepared phosphorus is a translucent, wax-like solid, which for safety sake must be kept under water; being very active chemically, it is eager to combine with other elements, particularly oxygen, so readily catches fire. For this reason it is never found uncombined in nature like some inactive metals such as native gold or silver. There are two varieties of phosphorus—the yellow which has been described above, and the red, which is made by heating the former out of contact with air. The red variety must be heated to a temperature of two and a half times that of boiling water before it catches fire. The yellow variety was once mixed with substances which readily gave up their oxygen and used for match heads, these matches would strike on any rough surface. The modern match head consists of materials rich in oxygen, which are ignited by rubbing on the safer red phosphorus on the sides of the boxes.

Yellow phosphorus is soluble in carbon bisulphide, and this solution, mixed with molasses, is used as a rabbit poison.

Phosphorus combines with oxygen forming, according to the conditions, phosphorus trioxide and phosphorus pentoxide (P_2O_5), the latter is of great importance in agriculture. Phosphorus pentoxide is commonly referred to

as "phosphoric acid," strictly speaking it is phosphoric oxide which is the anhydride of the commonest form of phosphoric acid. To make the acid, the solid white anhydride must be dissolved in water. The value of a phosphatic fertiliser depends on its "phosphoric oxide" content and not on its true phosphoric acid. In some countries the percentage of phosphate is given as "tri calcium phosphate," thus a manure containing 20 per cent. of P_2O_5 would be identical with one containing 43.7 per cent. of "$Ca_3(PO_4)_2$".

The value of a fertiliser to an agriculturist depends upon the solubility of the ingredients. The natural fluophosphate and hydroxyphosphate are very insoluble even when finely ground, so are not readily available to the growing plant. Many years ago experimentalists found that bones, which are more soluble than rock phosphate, improved crops, but in those days no one realised that a plant required phosphorus for successful growth. For a long time people argued that only water was required, and the plant got nothing from the soil. Others said plants used up the organic material in the soil, while some believed solid particles of soil

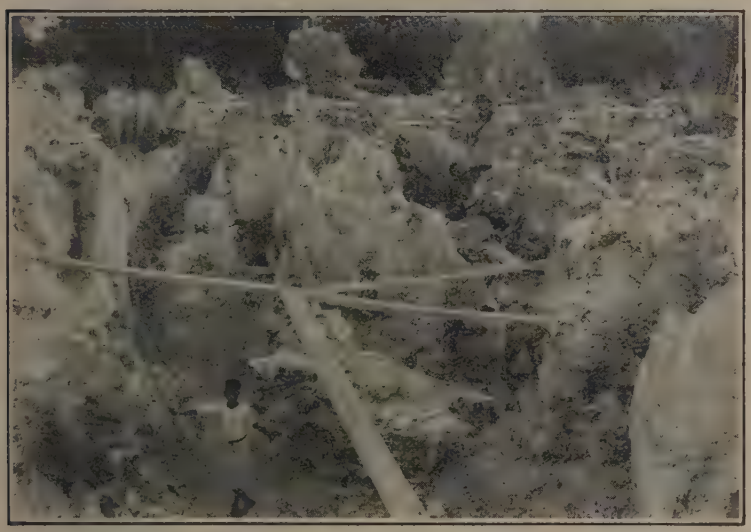
Phosphate and Coral, Ocean Island.
(Photo. by F. W. Steel.)

were absorbed by the plant, therefore the more the soil was broken up by cultivation the better it was for crops. Years later it was shown by cultures what elements, besides water and carbon dioxide from the air, were really essential for successful plant growth—among these elements was phosphorus.

It was known for a long time that bones contained phosphorus so a keen demand for bones was set up. About 1850 Liebig, a German chemist who emphasised several important theories in agricultural chemistry, some

not altogether correct, first published a method for making bones more soluble by treating them with sulphuric acid. Later, owing to the scarcity of bones, Lawes and Gilbert working at Rothamsted made superphosphate, for which they replaced the bones by rock phosphate. Liebig himself made the first artificial fertiliser by heating together potash, phosphates and lime, it was a failure however for the phosphate was rendered insoluble. He made a mistake in assuming that plants obtained their nitrogen from the ammonia of the air, so omitted to add it to his fertiliser. Insufficient knowledge of plant nutrition led him to believe that plant foods should not be easily soluble in the soil, else they would all be washed out in the drainage waters.

The important phosphates of calcium from the agricultural standpoint are the natural compounds previously mentioned which are very insoluble, the di-calcium phosphate which is soluble in very weak acid and solutions



Worked out phosphate deposit. Note coral mounds exposed.

of some complex substances in water, and the mono calcium or superphosphate which is easily soluble in water. On mixing the fluophosphate and hydroxyphosphate with the mono phosphate the di compound is readily formed if the water content of the mixture is high.

Some soils which contain much iron and only a little lime will not respond to superphosphate because the iron readily combines with the phosphate forming very insoluble iron phosphate, on such soils basic superphosphate—a mixture of super and lime—should be used, or what is known as basic slag. Where it is possible to apply lime economically this may be used followed by superphosphates.

By far the greatest quantity of phosphate used in Australia is obtained from islands scattered for the most part in tropical seas. It is the remains

of bird life accumulated over hundreds of years. Most of the islands are coral, and the phosphate is dug out by hand from between the masses. The phosphate rock is transported to the chemical works, where it is ground and mixed with proportions of sulphuric acid according to the purity of the original rock. The sloppy mixture of rock and acid is allowed to react in special bins. When the reaction is completed the product is dry, containing only a small percentage of moisture. Superphosphate is a mixture of monocalcium phosphate, gypsum and about one per cent. of the original phosphate rock, the removal of the gypsum is expensive, so it is allowed to remain.

Australian soils generally speaking are deficient in phosphate, while nitrogen and potash are fairly plentiful; the result is a great demand has been set up for phosphates. In 1906 West Australia used 8,600 tons of super and the amount increased to over 200,000 tons last year.

Phosphates increase the root development of plants thus giving them a greater feeding area resulting in better stooling of cereals and an increase in grain yield.

THE COMMON BLUE LUPIN.

(*Lupinus pilosus.*)

C. A. GARDNER and H. G. ELLIOTT.

It is only during recent years that lupins have established themselves as naturalised aliens in Western Australia. There is little doubt that they were originally introduced as ornamental plants, for many of the species are of horticultural value. Escaping from gardens they have acclimatised themselves and the first record we have of their occurrence as naturalised plants is from the vicinity of Cannington. The Woodlupine Brook and locality appear to have been named about the year 1903 from the prevalence of lupins there.

For many years the localised lupins were regarded as noxious weeds, which in spite of discouragement spread over wide areas, principally in the Victoria, Midlands, and Metropolitan districts, favouring the lighter types of soil, and making the most progress in the Jam country of the Northampton district, where they now cover large paddocks and line the roadsides for many miles. In time it was found that the seeds were relished by sheep, and provided fattening food in the summer months when feed was scarce, hence the outlook regarding lupins soon completely changed, and they came to be regarded as useful forage plants suitable to the lighter types of soil. Now the cultivation of these plants is encouraged, and lupin paddocks are considered to be valuable assets to the farmer in fattening sheep during the dry period of the year.

Much prominence has been given to lupins by the recent inauguration of a "Lupin Competition" by the "West Australian Newspapers, Ltd.," of Perth. This movement has stimulated farmers to cultivate lupins on a larger scale, and has been responsible for the introduction of lupins into

Explanation of Plate.

Plate 1.—a, Flowering receme and leaf, half natural size; b, Flower, half natural size; c, Flower, about three-quarters natural size; d and e, Calyx (d, view from below; e, side view) 1½ times natural size; f, Leaf, half natural size; g, Seeds, natural size; h, Seed pod, half natural size.

areas where they were not previously grown. The demand for seed has consequently been large, exhausting the supply of local seed at an early stage, and to meet the growing demand, large importations of seed of "Blue Lupins" have been recently made from New Zealand.

Concerning the species of lupins naturalised in Western Australia, our knowledge at the present time is meagre. *Lupinus pilosus* appears to be the most common species, and is the one described here; *L. hirsutus* occurs also, and may be the common blue lupin of the northern districts. A third blue-flowered species is *L. angustifolius* which is relatively unimportant and is found around Perth and Midland Junction, extending perhaps northwards as far as Gingin. A fourth species is a yellow-flowered lupin naturalised near Welshpool and Armadale. This may be the common yellow lupin (*L. luteus*) which has been responsible for heavy mortality amongst stock in other countries.

The species imported from New Zealand is *L. angustifolius* which is a form of the least important of the locally naturalised blue lupins. It has larger seeds than the local form of this species.

The lupin presumed to be the common blue lupin is *Lupinus pilosus*.

Description of Plant.—An annual or rarely biennial herbaceous plant attaining a height of four to five feet, though usually about three feet high. Leaves consisting of 9 to 13 leaflets radiating from the summit of a long petiole or leafstalk. The leaflets are oblanceolate in outline, concave or folded, two to three inches long and half to three quarters of an inch in width at the widest part, villous with fine close hairs on both surfaces; stipules small, linear, attached to the base of the leaf-stalk. Flowers in terminal racemes, the flowers of the top raceme opening first from below upwards, azure blue, all whorled; bracts lanceolate, falling early; bracteoles linear, attached to the calxy-tube. Calyx with two divergent lips, the upper one two-partite behind the standard, the lower (below the keel) longer, usually very shortly three-toothed, or occasionally 2-toothed; standard erect with reflexed edges, with a white blotch in the middle; wings much smaller; keel enclosed in the wings, incurved; stamens with united filaments; style incurved. Pod 1½-2 inches long, flattened, with 3-4 large seeds, constricted between the seeds, hairy outside, the persistent style forming a slender beak Seeds large, compressed, slightly roughened, pale grey-brown with dark mottling, about 3/8in. in diameter.

The name *Lupinus* is taken from the latin *Lupus* a wolf, from some fancied ability of the plants to prey upon the soil. There are upwards of three hundred species, a few of them being useful as soil renovators (especially *L. luteus*), for fodder, and for human food. There are two cultural groups, the large seeded agricultural species, and the ornamental species.

The common blue lupin is naturalised between the Murchison River and Busselton, particularly in the northern areas of this range, especially favouring the lighter soils. We do not yet know which species are most common in the different districts, but *L. pilosus* certainly has the widest range. Lupins are now being grown throughout the greatest part of the agricultural areas between the Murchison River and Esperance, although much of the seed planted consists of *L. angustifolius* imported from New Zealand, and it should be remembered that this species has not yet proved itself as a forage plant. It has been claimed that this latter species will

Explanation of Plate.

Plate 2.—a, Root system showing bacterial nodules (half natural size); b, Section through nodule (much enlarged), showing the zones comprising bacterial colonies above and below the root; c, Lupin nitrogen-fixing bacteria in the plant cells; d, The bacteria; Branching and rod forms of bacteria; (c, taken from G. T. Moore, from Harshberger, Mycology and Plant Pathology).

stand frost better than the naturalised species, but this is very doubtful, at least in some areas. This so-called "New Zealand Blue Lupin" is grown in New Zealand as a green manure crop, and not as a fodder plant. Unless it flourishes to an unexpected extent in Western Australia, it will be found to be much inferior to the local species because of its reduced size, smaller seeds, and its high capacity for germination—which may be a disadvantage when early rains occur followed by a dry period. This would necessitate reseeding the area.

Lupins in Europe and America are not regarded as fodder plants. On the other hand they are described as poison plants, and *Lupinosis* or lupin poisoning has caused them to be gazetted as poison plants in Canada and some States of the United States of America. As green manuring plants they are extensively grown in Europe, especially in Germany where *L. luteus* is the principal species under cultivation.

In Western Australia the naturalised blue lupins have proved to be of inestimable value to the pastoralist, particularly the sheep farmer. Stock should not be permitted access to lupins during the young stages of growth since grazing is fatal to the young plants. If there is abundance of other green feed, stock will not eat the lupin in a green condition. In the summer when the seeds have fallen, it is estimated that a lupin paddock will carry up to four sheep per acre and fatten them.

The Lupin is a hardy vigorous legume. Leguminous plants are well known for their value as food, forage plants and soil renovators. All leguminous plants possess the capability of obtaining nitrogen from the atmosphere. This is effected by nitrogen-fixing bacteria which are present in nodules upon the roots of these plants. These nodules are wart-like protuberances or outgrowths of the roots and are visible to the naked eye. They may be smooth, wrinkled, spherical, or of irregular shape, and may occur singly or in clusters at the side of, or surrounding the root. In the young stages they may be white, pink, yellow, or pinkish-brown, delicate in texture and mostly filled with nitrogen-fixing bacteria and nutrient plant-juices. They may be easily separated from the root since the connecting tissue is somewhat fragile. If these nodules are not present on lupin plants, the lupins cannot obtain nitrogen from the air, and since leguminous plants in general require more nitrogen than other plants, the absence of these nodules from lupins renders them soil impoverishers instead of soil builders. In soil poor in nitrogen, the lupin without nodules grows poorly or not at all.

In places where the lupin succeeds, the soil is said to be inoculated, *i.e.*, there are present in the soil the nodule-forming bacteria. These bacteria can be carried on the seed, and when planted with the seed they multiply rapidly, but their spread in the soil is slow. The bacteria which inoculate the lupin do not affect any other leguminous plant except Serradella (*Ornithopus sativus*) which is not grown in Western Australia. It is therefore incorrect to assume that where other legumes grow successfully and possess bacterial nodules, the lupin will be inoculated from them.

If one of the lupin nodules is sectioned transversely and examined with a high powered microscope the bacteria will be seen as numerous minute rod-like or Y-shaped bodies occupying definite zones in the tissue. These zones are indicated by the darkly shaded areas on the accompanying plate. The bacteria enter through the roots or the fine root hairs. The stimulation of the root-cells causes the formation of the nodules. In the nodules the bacteria

multiply rapidly, obtaining their food from the plant juices, and in return contribute a continuous supply of nitrogen to the plant in a form which is available as food. This nitrogen is obtained by the bacteria from the air present in the soil. The supply of nitrogen in the nodule is greatest when the plant commences to flower; from then onwards there is a reduction until the seed is fully ripe. The nodule ceases to develop when the seeds commence to form. They then lose their plump appearance, shrink and eventually decay. The bacteria return to the soil remaining there until they regain contact with roots the following season.

Natural inoculation, depending as it does, upon the introduction of seeds carrying the bacteria, wind or water, is slow and unsatisfactory. Artificial inoculation by soil infection is obtained by transferring soil from places where the lupin bacteria are known to be present, to the new land, but a preferable method is the introduction of pure bacteria in culture. This should be done in cool weather.

Not only is the lupin valuable as a fodder plant, but also as a soil renovator and fertiliser. Lupins succeed best in light sandy soils, provided the bacteria are present. Turned under as a green manure the lupin will contribute large amounts of the otherwise expensive fertiliser nitrogen, and in a form quickly available as plant food.

Since the lupin develops its seeds irregularly, and when ripe, they are instantly shed, hand harvesting is the best method for the farmer. Mechanical harvesting is the only practicable means over large areas, but the percentage harvested is less than in the case of hand picking.

Descriptions of Seeds.

1. Common Blue Lupin (*L. pilosus*).

Seeds roundish and flattened, the flattened sides being slightly concave; three-tenths to four-tenths of an inch in diameter, by one-eighth of an inch in thickness; round and dull (not shining) the roughness being due to minute warts or protuberances on the surfaces. The colour is greyish-brown with dark brown spots or streaks, giving the seed a more or less speckled appearance. Germination poor, ranging from 10-50 per cent. This low germination is due not to dead seeds, but to the high percentage of hard seeds which do not germinate readily (many remaining dormant in the soil for one or more years), and is to be regarded as an advantage in established areas, since the germination resulting from inadequate early rains from which the plants will not survive, will not materially affect the ultimate crop. It is however, a disadvantage when endeavouring to establish a good stand during the first season.

2. Hairy Lupin (*L. hirsutus*).

This appears to be the other valuable naturalised lupin. The seeds are not available to us for description, but they are said to differ from those of *L. pilosus* in being smooth and the mottling more pronounced.

3. Narrow-leaved Blue Lupin (*L. angustifolius*).

a. *Western Australian Seed*: These seeds differ in shape and size from those of *L. hirsutus* and *L. pilosus*. They are not flattened but more or less egg-shaped or almost spherical, three-

tenths of an inch and under in length, by one-fifth of an inch across. They are smooth and shining, slate-grey in colour with chocolate-brown streaks and lighter grey spots, giving a decidedly speckled appearance to the seed. The germination is slightly higher than that of the Common Blue Lupin, and there is always a percentage of hard seeds.

b. *New Zealand Seed*: These are of the same shape as the local seeds, but they are much larger, being over three-tenths of an inch in length by a quarter of an inch in diameter. The speckled appearance in general is not so pronounced, the slate-grey colour being more predominant, and the chocolate-brown streaks are not so distinct. The germination is high (up to 100 per cent.). This is not to be regarded as an advantage, since unseasonal rains may cause the total germination of the seeds in the soil, and re-seeding will be necessary when the normal season commences.

4. Yellow Lupin (*L. luteus*).

It is supposed that this is the yellow lupin naturalised along the South-Western railway. The seeds of this species are the largest of those described here; they are dull light grey or almost white, with pale brown markings.

Lupins grown near Esperance.

THE INOCULATION OF LUPINS AT THE MERREDIN EXPERIMENT FARM.

L. J. H. Teakle and E. J. Limbourn.

The lupin is a member of the order known as *Leguminosae,* which includes, in addition, such plants as clovers, lucerne, trefoil, peas, beans, acacias and a host of others. It was very early noticed that the legumes usually had tubercles or nodules on their roots and that, when affected by these nodules, they could grow on poor sandy soils and improve its fertility for other types of plants. Two German chemists, Hellriegel and Wilfarth, in 1888 found that leguminous plants, when infected with nodules, were able to absorb their supplies of nitrogen from the air and thus grow vigorously on poor, nitrogen-deficient soils. Other plants, and also legumes with no nodules on their roots, were unable to make use of the nitrogen of the air, and consequently starved on these soils.

The same year, 1888, Beijerinck, a clever Dutch bacteriologist, isolated the bacteria which caused the formation of the nodules on the roots of leguminous plants. It was later proved that these bacteria actually "fix" the nitrogen of the air in such a form that it is available for the use the host plant. It has also been found that these bacteria live in the soil and infect the roots of their respective legumes in a similar manner to those organisms which cause root diseases. Instead of damaging the plants infected, under normal conditions both bacteria and host plants flourish, the bacteria supplying the plants with nitrogenous foods and taking their own nourishment, in the form of carbohydrates, etc., from the host plants which build these compounds from water and the carbon dioxide of the air.

There are a number of different strains of the legume organism. Each strain infects a particular group of legumes but is unable to infect members of other groups. One strain infects clovers, another infects lucerne. Still another strain infects the lupin family. When a new legume is introduced into a country it is most probable that the particular strain of bacteria which associates with this legume is absent from the soils. It is then necessary to introduce with the legume its own particular strain of bacteria. Thus Soya beans failed in America until the correct strain of bacteria was imported from the Orient—the home of the Soya bean.

Lupins have been grown in the coastal regions of Western Australia for many years and in such situations usually carry nodules on their roots. The strain of bacteria peculiar to lupins was probably introduced with the lupin seed in the early days and spread with the lupin. At Merredin, however, the lupins have never formed nodules on their roots either on the slightly alkaline forest soils or on the slightly acid mallee soils. In view of this fact, it was decided to test this year the effect of inoculating the soil to be planted with lupins with small amounts of soil from the Chapman Experiment Farm which is known to carry the organism. The soil from Chapman was sprinkled in one row with the lupin seed while in the other row the seed was planted without any addition of the infected soil. As a result, the lupin plants growing in the row treated with soil from the Chapman Experiment Farm are heavily infected with the characteristic

root nodules while those from the untreated row are perfectly clean. Fig. 1 shows a representative member of the plants from each of the two rows. There can be no doubt as to the effectiveness of the inoculation. Very little

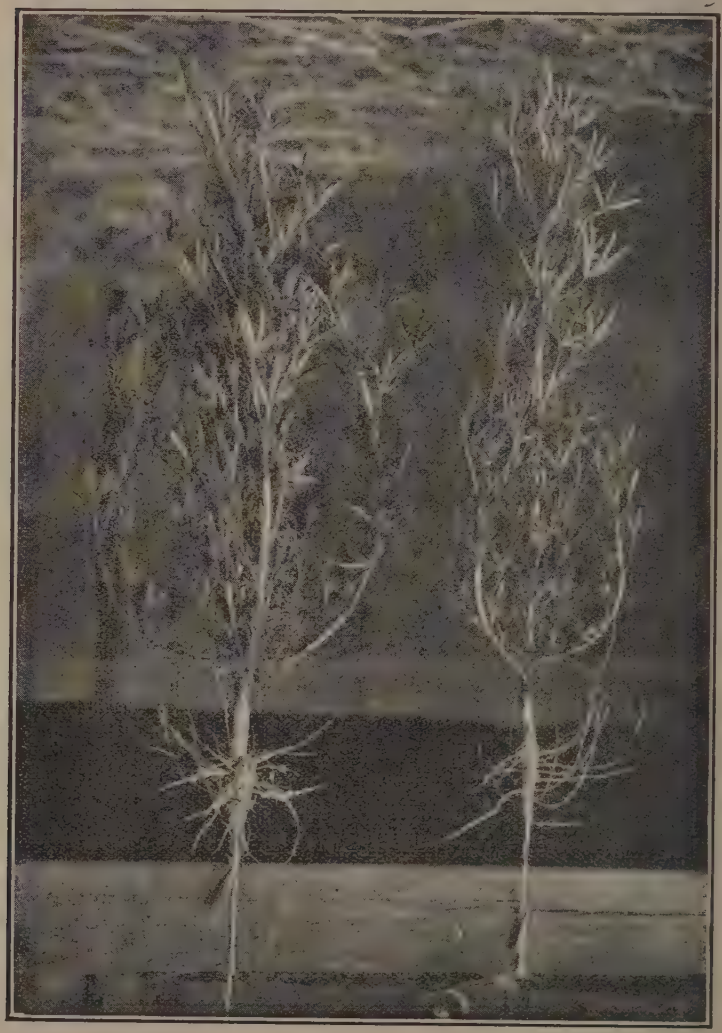


Fig. 1.

Lupin plants from uninoculated and inoculated soil at the Experiment Farm, Merredin, 27th August, 1929.

Left: Plant from uninoculated soil.

Right: Plant from inoculated soil.

Note the abundance of nodules on the roots of the plant grown in the inoculated soil. No nodules are to be found on the roots of the plant from the uninoculated soil.

difference is to be noted in the growth of the plants in the two rows at this time (27th August, 1929) probably owing to the natural richness of the Merredin soil with respect to nitrate-nitrogen. It will be interesting to observe the plants as they grow to maturity with and without the nodules.

It is quite possible, in fact very probable, that inoculation may be necessary for the most satisfactory growth of lupins on the poorer soils of the wheat belt when the lupin bacteria are not already present in the soil.

The authors wish to acknowledge their indebtedness to Mr. G. L. Sutton and Mr. H. A. Pittman who kindly read the manuscript and offered suggestions in connection with the preparation of the paper.

BEEKEEPING NOTES.

by

H. Willoughby Lance.
Apiculturist.

HIVE RECORDS.

The keeping of records is to-day one of the most essential factors in all important businesses, whether of production or distribution. The solving of important scientific problems often depends on the correct recording of facts, so that all factors that effect the problem may be studied as a whole over a period of time.

Successful beekeeping is no exception to the rule. When the colonies number dozens or perhaps hundreds, the mind that can retain all the essential points of the condition of the hives at the last inspection; the productiveness and general qualities of each Queen over a period of a couple of years; the blossoming period of the honey producing trees and their cycle of productiveness; is an exceptional one. Therefore, the beekeeper who wishes to obtain the best returns from his colonies needs to have his records in such a form as not to rely entirely upon memory.

The following are a few hints how this may best be done. To commence with all the colonies must be numbered either from one upwards, or by lettering of the rows or locations, and giving each hive in the row or location a number thus B 3 = row B, number 3 colony. Another method is

to place the hives in clusters of 5, and these clusters in rows; each row has a letter, and each cluster a number, as shown in Fig. 1. Then B. 4.3. would mean Row B, cluster 4, hive 3. The next is a note book which is equivalent

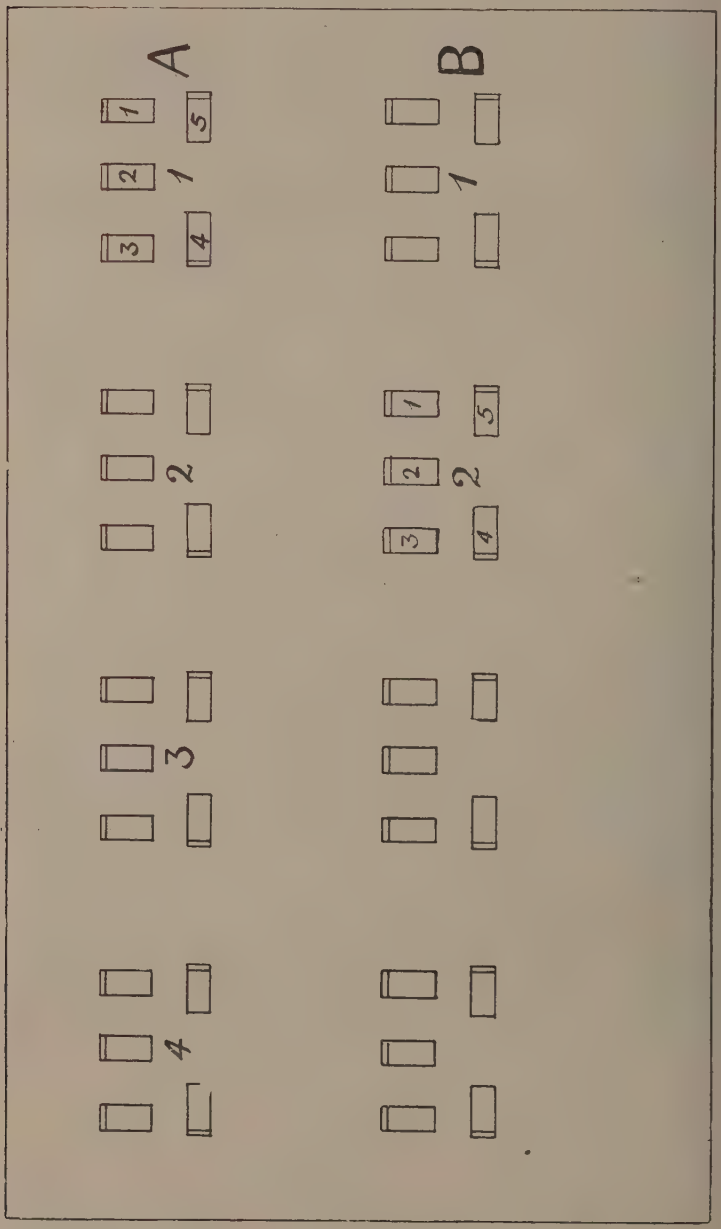


Fig. 1.

to the business man's day book. This should be entered up as the work progresses, and contain all the essential facts of the conditions and work done. For instance:

Aug. 13—Q R. Br. good. St. poor; means Queen right, Brood good, stores poor. This day book should be entered into what may be termed the ledger, which will be a record of each colony, and may be in the form of a book or by reference cards on the card index system. All the items in the day book need not be entered, only the essential ones showing the worth of the colony and queen, for instance the only one necessary from the above example would be Br. good.

Some beekeepers who use quilts, and a space between the quilts and the cover keep a large piece of cardboard here which acts as the ledger.

In a separate book or on cards, should be entered from time to time a record of the date when blossoms are observed on the various honey producing flowers or trees and later a note as to whether it was sparse or plentiful and the quantity and quality of the honey therefrom.

In many cases of records all one needs to know was the condition of the colony at the last inspection, indicating the probable work required. For this purpose, I have evolved a hive recorder which gives at a glance the condition and date of last inspection. This does away with entries in the day book which are not needed for the ledger.

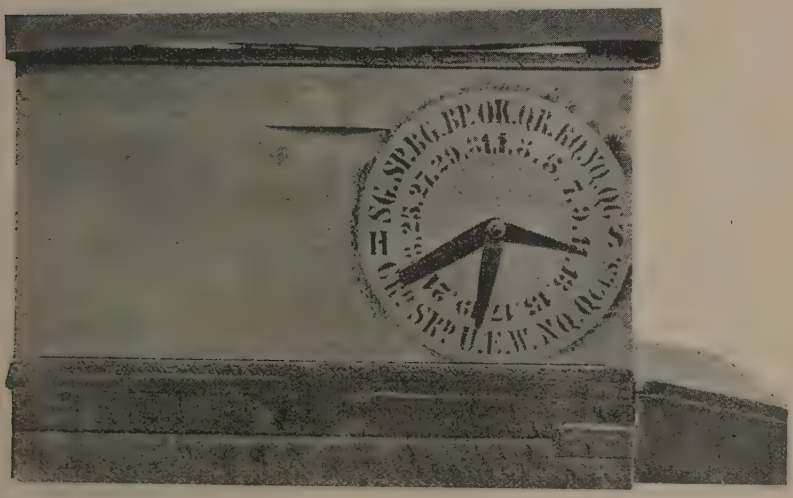


Fig. 2.

All that is needed is a stencil plate and a set of hands for each hive as illustrated herewith (Fig. 2.) The outer circle is the record of the condition of the hive and may have two or three hands as desired. The inner circle shows the day of the month of the inspection. If more than a month is likely to intervene before the next inspection, the month may be written in pencil at the side of the dial.

The interpretation of the letters on the large dial are as follows:—

Q R = Queen right
R Q = Requeen
Y Q = Young Queen
Q C = Queen clipped
S = Strong
Q cls = Queen cells
N Q = No queen
W = Weak
E = Examine
U = Unite
S Rd = Super required
C Rd = Combs required
H = Honey to come off
S G = Stores good
S P = Stores poor
B G = Brood good
B P = Brood poor
O K = All's well.

Very often an apiarist has not much time to spare and wishes only to attend to the most urgent work. With the above system, he would on arrival walk through his apiary, glance at the recorders, and make a note of the hives that want attention.

Figure 3 shows three hives on an antproof stand, particulars of which were given in the June number of the Journal. This stand has room for the placing of the supers between the hives when manipulating. The centre hive has been converted into a middle entrance hive for the purpose of Queen rearing and has a queen excluder between the two boxes. The usual alighting board has been removed and placed at the side of the hive, and the entrance blocked so that all bees must enter and leave from the centre.

It is intended as the hives are overhauled to convert all the floor boards to have detachable alighting boards as this is convenient when moving hives from one situation to another.

This photograph shows how easy it is with the recorders in use, to walk through the apiary and realise the condition of each hive at the last inspection.

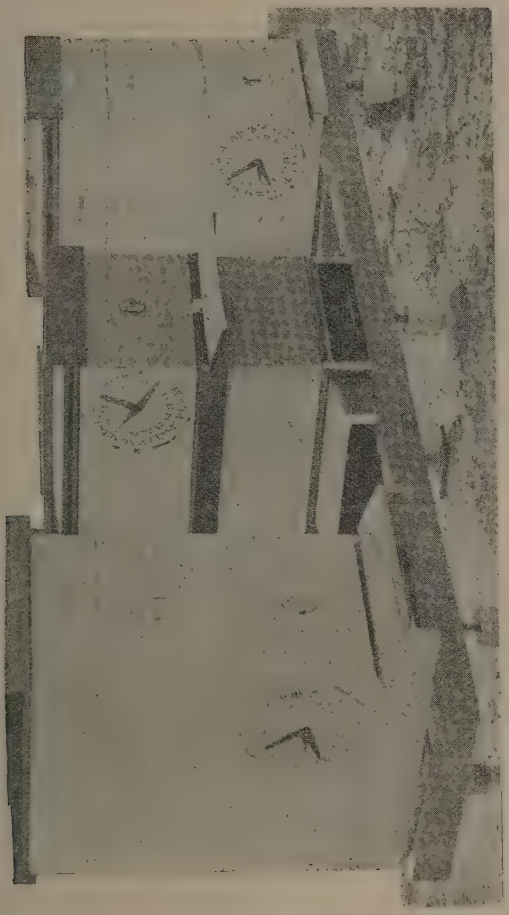


Fig. 3.

THE COST OF FEEDING PURE BRED COWS UNDER THE AUSTRALIAN OFFICIAL HERD RECORDING SCHEME.

P. G. HAMPSHIRE,
Sperintendent of Dairying.

P. C. COUSINS.
Senior Herd Recorder.

As has been the practice for the past six years, the details of the cost of feeding all cows submitted to the Australian Official Herd Recording Scheme have been carefully kept during last year, and the accompanying tables supply the data obtained. In Table 6 the averages under the various headings for six years' work are given.

During the year 14 pure bred herds have been tested, made up as follows: Jersey, 5; Milking Shorthorn, 4; Guernsey, 4; Red Poll, 1.

A slight improvement on 1928 figures is shown in the average yield, cost of feeding, and net profit per cow.

In the 14 herds referred to are included herds situated within the environs of the city of Perth, the outlying suburbs, and country districts.

Table I. contains the data for the year under review, and some interesting comparisons may be made of the different herds:—

	Yield of Fat per Cow.	Cost of Feed per Cow.	Profit per Cow.
	lbs.	£ s. d.	£ s. d.
Herd "D"	287	7 14 0	18 18 10
Herd "M"	323	25 18 0	3 18 3
Difference ...	36	18 4 0	15 0 7

Herd "D" and Herd "M" are of a similar breed, and both are country herds.

In regard to Herd "M," the cost of feeding is obviously expensive. Although situated in the country, this herd is confined to a small area where it is impossible to grow the major portion of the feed consumed, and the high cost of feeding the herd is, therefore, to a certain extent attributable to this factor. However, in this case the owner is a new entrant to the Herd Testing Scheme and at the outset was feeding a very expensive and unbalanced ration, which has been greatly improved upon as the result of advice offered by this Department.

From the above figures it will be seen that a herd yielding an average of 36 lbs. more butter fat in 9 months shows a profit of £15 0s. 7d. less per cow than a herd yielding 287 lbs. butter fat on an average. This is a definite

illustration of the fact that high average returns do not necessarily indicate high average profit returns.

A comparison between Herds "B" and "M" in the following table is also interesting, the herds being of similar breeds, and the yields of the cows being nearly the same:—

——	Yield of Fat per Cow.	Cost of Feed per Cow.	Profit per Cow.
	lbs.	£ s. d.	£ s. d.
Herd "B"	327	11 7 9	19 6 6
Herd "M"	323	25 18 0	3 18 3
Difference ...	4	14 10 3	15 8 3

The profit in this case is even more than that of the two herds illustrated previously, although the cost of feeding per cow in the case of Herd "B" was 50 per cent. greater than the cost of feeding Herd "D," the difference being accounted for by the higher average return received.

A comparison of Herds "D" and "B" is worth recording, and is as follows:—

——	Yield of Fat per Cow.	Cost of Feed per Cow.	Profit per Cow.
	lbs.	£ s. d.	£ s. d.
Herd "D"	287	7 14 0	18 18 10
Herd "B"	327	11 7 9	19 6 6
Difference ...	40	3 13 9	0 7 8

The difference, as will be seen, in the cost of feed is considerable, but the average profit per cow slightly favours Herd "B" by virtue of the increased production obtained.

A comparison of Herds "K" and "M" is worth noting in view of the fact that it shows that a poor average herd, even when expensively fed, does better than a herd of good average production most expensively fed:—

——	Yield of Fat per Cow.	Cost of Feed per Cow.	Profit per Cow.
	lbs.	£ s. d.	£ s. d.
Herd "K"	220	15 8 6	4 15 8
Herd "M"	323	25 18 0	3 18 3
Difference ...	103	10 9 6	0 17 5

In this case, a herd with an average of 103 lbs. butter fat less than another shows a slightly higher profit per cow. In neither case, however, is the profit sufficiently high to be considered economically profitable.

It will be recognised that, in making comparisons in the results of the different herds for the year ending 30th June, 1929, quite a number of factors must be taken into consideration, the main being the inherent productive capacity of the different cows in the herd, the manner in which they are managed and fed, and the situation or locality of the property on which the animals are located, the two principal factors, however, being "breeding" and "feeding." In the first place, the animals must be bred to produce, and in the second instance they must be fed economically. A dairy farmer to produce butter fat economically must, in addition to having stock that are bred to produce, grow the major portion of the feed on the property. The purchasing of expensive forms of stock feed is attended, as a rule, by unprofitable returns from dairy cows even in the case of fairly high production animals.

We have never favoured the introduction of a controversy in regard to the merits of the different breeds of dairy stock, as experience proves that there are good animals and good strains of animals in each of the main dairy breeds and that, having made due allowances for the differences of the climatic and pasturage conditions that may obtain, all of the good dairy breeds have their merits, the main consideration between two principal variations of the breeds being the marketing of the produce. Heavy milking breeds, such as the Milking Shorthorn and Ayrshire, are as a rule more economical as milk producers—where the sale of fresh milk is the main consideration—than the Channel Island breeds such as the Jersey and Guernsey. Where, however, the production of butter fat is the principal object, frequently the Channel Island breeds show to advantage when proper recording of the cost of feeding the cows is noted.

A comparison of the three principal dairy breeds in the herds represented under test will be of interest, the particulars of which are contained in the following table:—

——	Average Yield of Fat.	Average Cost of Feed for period.	Average Profit as Fat over Cost of Feed.	Average Profit as Milk over Cost of Feed.
	lbs.	£ s. d.	£ s. d.	£ s. d.
Guernsey (4 herds) ...	293	13 17 10	13 6 11	16 2 9
Milking Shorthorn (4 herds)	288	16 2 5	11 19 5	21 5 7
Jersey (5 herds) ...	296	14 14 3	11 1 6	12 17 4

The results show that the average yields of the herds of the different breeds are comparatively even, with a slight advantage to the Jersey, the next in order being the Guernsey, whereas the cost of feed of the different herds favours the Guernsey, with the Jersey next in order. The profit from the sale of the productions as fat favours the Guernsey, with Milking Shorthorn next in order, and the profit from the sale of the production as milk strongly favours the Milking Shorthorn, with Guernsey following.

The herds shown in the above table are situated in different parts of the State and might reasonably be taken as an average of the breeds, but in fairness to the Jersey herds it should be stated that one is not up to the average

standard of production and two of them are being expensively fed. The same also applies in regard to one Guernsey herd, and in the case of Milking Shorthorns the average cost of feeding the herds is fairly constant, the difference being accounted for by the high calibre of the production of the herds. For instance, one Milking Shorthorn herd shows a profit of £30 2s. 11d. per cow over cost of feed, when the produce is sold as milk at 1s. 3d. per gallon, whereas another herd shows a profit of only £11 5s. 4d. per cow. There are, however, greater variations in the yields of the Jerseys and Quernsey herds in regard to the profits of the herds over cost of feeding, which is largely accounted for by the high average production of the top herds. The cost of feeding for the average pound of fat produced shows a marked difference and varies in the case of Herd "D" at 6.44d. per lb. of fat produced to, in the case of Herd "N," 20.21d. per lb., the average of all herds being 12.24d. per lb. of fat. In regard to milk production, the variation again is marked, the difference being from 3.29d. to 11.63d. per gallon, the average for all herds being 5.74d.

Table VI. discloses the results of six years' recording and may be taken as a very true average under all conditions, taking into consideration good, fair, and poor cows; good, fair average, and poor managers; good, medium, and poor feeders: good, fair and poor farms, situated in the city, suburban, and country districts, with the principal dairy breeds under test. A point, however, that should be considered is that, apart from the first year that Herd Testing was in operation, when the majority of the cows under test were mature animals, the majority of the animals entered for test since that period have been young stock on their first, second, or third lactation, especially during the last three years. The averages obtained, therefore, may be taken as reasonably reliable, and are as follow:—

Average Yield per Cow.		Average Value of Skim Milk.	Average Cost of Feed per Cow for period.	Average Profit per Cow on average price obtained for Butter Fat.	Average Profit where Milk sold at 1/3 per gallon over Cost of Feed.	Average Cost to produce 1lb. of Butter Fat.	Average Cost to produce one gallon of Milk.
Milk.	Butter. Fat.						
gall.	lbs.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	pence.	pence.
616	301·08	3 2 10	14 2 6	12 16 11	17 11 7	11·2	5·62

TABLE I.—HERDS IN ORDER OF MERIT AS PRODUCERS OF BUTTER FAT, YEAR ENDED 30TH JUNE, 1929.

Columns.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Herd.	Average Fat per Cow for Period of 9 months.	Average Skim Milk per Cow for Period.	Value of Fat for Period at 1s. 8d. per lb.	Value of Skim Milk for Period at 2d. per gallon.	Average Value of Fat and Skim Milk per Cow for Period.	Cost of Feed per Cow for Period.	Net Profit per Cow for Period through sale of Fat.	Value of Whole Milk at 1s. 3d. per gallon allowing for rearing calf.	Net Profit per Cow by sale of fresh milk milk af 1s. 3d. per gallon.	Cost of Feed per 100lbs. Fat.	Cost of Feed per gallon of Milk.
	lbs.	gall.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	d.
A	370·09	670½	30 16 10	5 11 9	36 8 7	15 10 3	20 18 4	52 3 4	36 13 1	4 3 10	3·94
B	327·60	409½	27 6 0	3 8 3	30 14 3	11 7 9	19 6 6	35 5 3	23 17 6	3 9 7	4·16
C	377·70	591	31 9 6	4 18 6	36 8 0	17 2 4	19 5 8	47 5 3	30 2 11	4 10 9	4·79
D	287·18	325	23 18 8	2 14 2	26 12 10	7 14 0	18 18 10	29 10 11	21 16 11	2 13 8	3·29
E	302·13	536	25 13 6	4 19 4	30 12 10	13 8 6	17 4 4	42 18 10	29 10 4	4 8 10	4·04
F	291·97	368	24 6 8	3 1 4	27 8 0	11 0 7	16 7 5	31 16 11	20 16 4	3 15 6	4·34
G	291·70	287	24 6 2	2 7 10	26 14 0	11 11 6	15 2 6	27 9 9	15 18 3	3 19 3	5·35
H	345·30	359	28 15 6	2 19 10	31 15 4	16 17 7	14 17 9	32 13 9	15 16 2	4 17 10	6·76
I	281·64	337	23 9 4	2 16 2	26 5 6	11 17 6	14 8 0	30 3 0	18 5 6	4 4 2	4·96
J	262·87	374	21 18 4	3 2 4	25 0 8	17 16 1	7 4 7	31 19 9	14 3 8	6 15 4	6·93
K	220·55	219	18 7 8	1 16 6	20 4 2	15 8 6	4 15 8	22 0 7	6 12 1	7 0 3	8·35
L	212·11	314	17 13 6	2 12 4	20 5 10	16 2 9	4 3 1	27 8 1	11 5 4	7 12 8	7·05
M	323·85	345	26 19 9	2 17 6	29 16 3	25 18 0	3 18 3	31 8 7	5 10 7	7 19 10	10·66
N	206·33	142	17 3 10	1 3 8	18 7 6	17 7 2	1 0 4	17 12 0	0 4 10	8 8 5	11·63
Averages ...	295·10	386	24 11 10	3 4 4	27 16 2	15 1 0	12 15 2	33 6 9	18 5 9	5 2 0	5·74

AVERAGE COSTS OF FEEDS.

Oaten or Wheaten Chaff, £5 per ton; Bran, £8 5s. per ton; Pollard, £9 5s. per ton; Crushed Oats, 3s. per bushel; Linseed Meal, £13 10s. per ton; Lucerne pasture, 3s. per week; Lucerne Hay, £7 per ton; Green Maize, 7s. per ton; Silage, 7s. per ton; Brewer's Grains, 6d. per bushel; Pasture, 1s. 6d. per week; Soudan Grass Pasture, 3s. per week, or 7s. per ton; Subterranean Clover Pasture, 3s. per week; Green Lucerne, £2 per ton; Barley, green, 7s. per ton, or 3s. per week as pasture; Clover Hay, £3 10s ton. per.

AVERAGES OF ALL COWS RECORDED.

TABLE II.

	£	s	d
1.—629 gallons of Milk, and 295·1lbs. Butter Fat.			
2.—386 gallons of Skim Milk per Cow.			
3.—Value of Butter Fat at 1s. 8d. per lb.	24	11	10
4.—Value of Skim Milk available for Pig feeding	3	4	4
5.—Total credits to Cow by sale of Butter Fat and Skim Milk ...	27	16	2
6.—Cost of Feed for period	15	1	0
7.—Profit by sale of Butter Fat after deducting feed costs	12	15	2
8.—Value of Whole Milk if sold at 1s. 3d. per gallon	33	6	9
9.—Profit by sale of Fresh Milk at 1s. 3d. per gallon after deducting cost of Feed	18	5	9
10.—Cost of Feed per 100lbs. Butter Fat produced	5	2	0
11.—Cost of Feed per gallon of Milk produced			5·74

HERDS IN ORDER OF MERIT AS PRODUCERS OF MILK.

TABLE III

Herd.	Milk Average Gals.	Butter Fat, Average lbs.	Cost of Feed per Cow.	Profit as Milk.	Profit as Fat.	Cost to Produce 100lbs. Fat.	Cost to Produce 1 gallon Milk.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	d.
A	945	370·09	15 10 3	36 13 1	20 18 4	4 3 10	3·94
C	857	377·70	17 2 4	30 2 11	19 5 8	4 10 9	4·79
E	796	302·13	13 8 6	29 10 4	17 4 4	4 8 10	4·04
B	655	327·60	11 7 9	23 17 6	19 6 6	3 9 7	4·16
D	561	287·18	7 14 0	21 16 11	18 18 10	2 13 8	3·29
F	609	291·97	11 0 7	20 16 4	16 7 5	3 15 6	4·34
I	574	281·64	11 17 6	18 5 6	14 8 0	4 4 2	4·96
G	519	291·70	11 11 6	15 18 3	15 2 6	3 19 3	5·35
H	599	345·30	16 7 7	15 16 2	14 17 9	4 17 10	6·76
J	615	262·87	17 16 1	14 3 8	7 4 7	6 15 4	6·93
L	549	212·11	16 2 9	11 5 4	4 3 1	7 12 3	7·05
K	443	220·55	15 8 6	6 12 1	4 15 8	7 0 3	8·35
M	583	323·85	25 18 0	5 10 7	3 18 3	7 19 10	10·66
N	358	206·33	17 7 2	0 4 10	1 0 4	8 8 5	11·63
Averages ...	629	295·10	15 1 0	18 5 9	12 15 2	5 2 0	5·74

HERDS IN ORDER OF MERIT SHOWING COST OF FEED PER 100 LBS. FAT.

TABLE IV.

Herd.	Cost of Feed per 100lbs. Fat.	Under Average.	Over Average.
	£ s. d.	£ s. d.	£ s. d.
D	2 13 8	2 8 4	
B	3 9 7	1 12 5	
F	3 15 6	1 6 6	
G	3 19 3	1 2 9	
A	4 3 10	0 18 2	
I	4 4 2	0 17 10	
E	4 8 10	0 13 2	
C	4 10 [illegible]	0 11 3	
H	4 17 10	0 4 2	
J	6 15 4	...	1 13 4
K	7 0 3	...	1 18 3
L	7 12 3	...	2 10 3
M	7 19 10	...	2 17 10
N	8 8 5	...	3 6 5

Average of all Herds—£5 2s. 0d.

HERDS IN ORDER OF MERIT, SHOWING COST OF FEED PER GALLON OF MILK PRODUCED.

TABLE V.

Herd.	Cost of Feed per gallon of Milk.	Under Average.	Over Average.
	d.	d.	d.
D	3·29	2·45	
A	3·94	1·80	
E	4·04	1·70	
B	4·16	1·58	
F	4·34	1·40	
C	4·79	·95	
I	4·96	·78	
G	5·35	·39	
H	6·76	...	1·02
J	6·93	...	1·19
L	7·05	...	1·31
K	8·35	...	2·61
M	10·66	...	4·92
N	11·63	...	5·89

Average—All Herds—d. 5·74.

HERD AVERAGES FOR 6 YEARS—1924–1929.

TABLE VI.

Year.	Milk.	Average Fat per Cow for Period of 9 months.	Average Skim Milk per Cow for Period.	Value of Fat for Period.	Value of Skim Milk for Period at 2d. per gallon.	Average Value of Fat and Skim Milk per Cow for Period.	Cost of Feed per Cow for Period.	Net Profit per Cow for Period through sale of Fat.	Value of Whole Milk at 1s. 3d. per gallon allowing for rearing calf.	Net Profit per Cow by sale of Fresh Milk at 1s. 3d. per gallon.	Average Cost to produce 1lb. of Fat.	Average Cost to produce1 gallon of Milk.
	galls.	lbs.	galls.	£ s. d. (at 1s. 8d. per lb.)	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Pence.	Pence.
1929 ...	629	295·10	386	24 11 10 (at 1s. 7½d. per lb.)	3 4 4	27 16 2	15 1 0	12 15 2	33 6 9	18 5 9	12·24	5·74
1928 ...	592	280·56	353	22 15 9 (at 1s. 7d. per lb.)	2 18 10	25 14 7	15 11 4	10 3 3	30 19 0	15 7 8	13·34	6·31
1927 ...	602	290·72	362	23 0 4 (at 1s. 7d. per lb.)	3 0 4	26 0 8	14 10 5	12 6 8	31 10 6	17 0 1	12·00	5·79
1926 ...	624	312·01	393	24 14 0 (at 1s. 5½d. per. lb)	3 5 6	27 19 6	14 14 7	13 4 11	32 5 5	17 10 10	11·15	5·66
1925 ...	652	308·59	407	22 10 0 (at 1s. 7½d. per lb.)	3 7 10	25 17 10	14 13 2	11 4 8	30 10 5	15 9 5	10·77	6·15
1924 ...	600	319·50	362	25 19 2 (at 1s. 7d. per lb.)	3 0 4	28 19 6	10 4 10	18 4 8	32 1 3	21 16 5	7·7	4·09
Average for 6 years	616	301·08	377	23 16 7	3 2 10	26 19 5	14 2 6	12 16 11	31 15 6	17 11 7	11·20	5·62

THE EELWORM-GALL OR ROOT-KNOT DISEASE.

(Caused by *Caconema radicicola* (Greef) Cobb, formerly known as *Heterodera radicicola* (Greef) Müller.)

H. A. PITTMAN, B.Sc.Agr.,
Plant Pathologist.

Although apparently unknown in the south-western portions of this State, *Caconema radicicola*, the organism responsible for the development of eelworm-galls or root-knots on the underground portions of many of our cultivated plants, is widely distributed in the metropolitan zone around Perth, and has recently attracted considerable attention in the light sandy soils of the Geraldton area. (Fig. 1.)

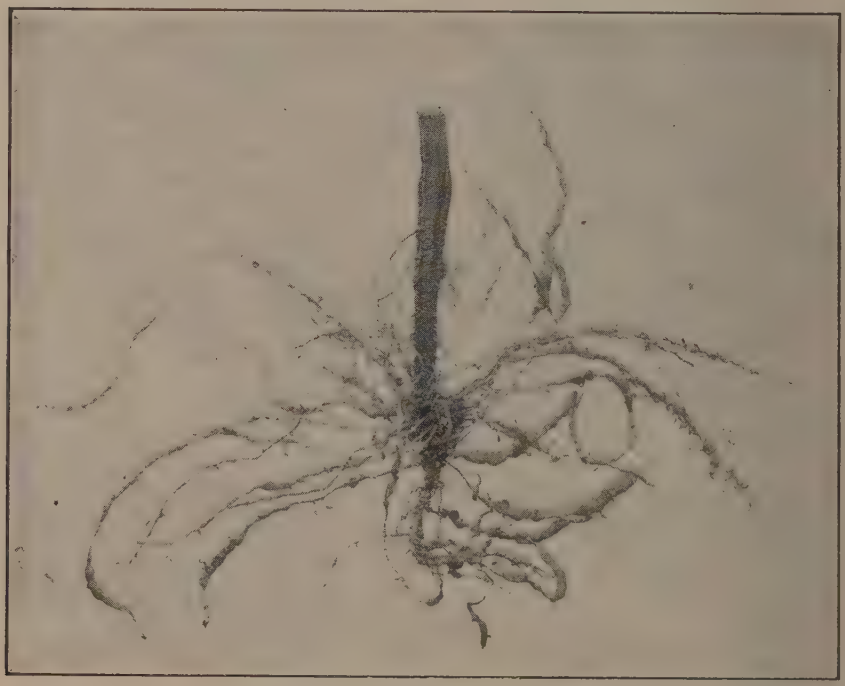


Fig. 1.
Eelworm-galls on roots of young tomato plant from Geraldton.

Photo. by Author.

The eelworms in question are very small round worms, somewhat less than 1/25 inch in length, which may attack the underground parts and form galls on almost all our cultivated species with the exception of most grasses and cereals (wheat, oats, barley, rye, maize, etc.) and a limited number of other plants.

In Western Australia the worms have been found forming galls on the roots or other underground-parts of potatoes, tomatoes, cape-gooseberries, marrows, pumpkins, melons, cucumbers, carrots, parsnips, beetroot, beans, mangolds, tobacco, rhubarb, grapes, figs, banana, dahlia, boronia, *Ceinfugosia hakeifolia*, wattles, and many other plants of an edible, flowering, or ornamental nature. Cauliflowers, cabbages, peas, asparagus, artichoke, spinach, onions, and sweet potatoes are not usually attacked to such an extent as the other market-garden plants previously mentioned. Considerable differences in varietal susceptibility occur in almost all plant species attacked. *The eelworms are rarely, if ever, found in heavy clay soils, but thrive abundantly in loose, well-drained, sandy soils in warm districts or situations.* It is on this account that eelworms have so successfully established themselves in the Perth district and environs. The disease is very serious in many parts of the world where flowers or vegetables are grown under glass, and under such circumstances periodic sterilization of the soil by means of steam is commonly practiced to rid the soil of the pest. Unfortunately this method is at present quite impracticable in Western Australia.

Symptoms and Effects.

Plants badly affected are dwarfed, wilt readily in hot weather, and are usually a paler green than healthy ones. Seedlings and even older plants may be killed in quick time if severely attacked, or great reduction in yield may result. Sometimes, however, little damage or reduction in yield is apparent, *especially if abundance of water, fertiliser and organic matter can be supplied to the plants.* In this connection it is very well worthy of note that any means which tend to reduce the proportion of top-growth to rooting system (such as pruning out of excess lateral shoots in tomatoes and the copious use of superphosphate and sulphate of potash) will tend to reduce the injury done by the worms.

On being pulled up infected plants will be found to show more or less numerous warts or swellings of the roots or other underground-parts. Potatoes are usually attacked on the tubers, but the organisms may also invade the roots and underground stems. Infected potato tubers show many or few, more or less scattered, flat-topped pimples or blisters on the surface, often about one-eighth inch in diameter and elevated about the same distance above the general level of the healthy tissues. (Fig. 2.) The lesions may be much larger, however, in certain cases, and where attack is bad may be very close together, giving a much distorted appearance to the affected parts. Sometimes numbers of the blisters will be found to be broken open or decayed as a result of subsequent attack by fungi or bacteria. If infected potatoes are cut open, small brown areas will be seen in the flesh under the pimples and extending to a depth of about ¼″ in some cases. It is in these brown areas that the eelworms occur, but on account of their very small size the males and young are not readily seen without a strong lens or microscope. The mature egg-filled females, however, are much broader than the other stages, being pear-shaped and about 1/25th inch in diameter, and they can sometimes be distinguished with the naked eye as glistening pearly-white bodies within the discoloured tissues. Eelworms are often introduced into clean land in potato peelings, and this may be considered one of the main means of dissemination by unsuspecting persons. The use of the manure of animals fed on infected plants also leads to the

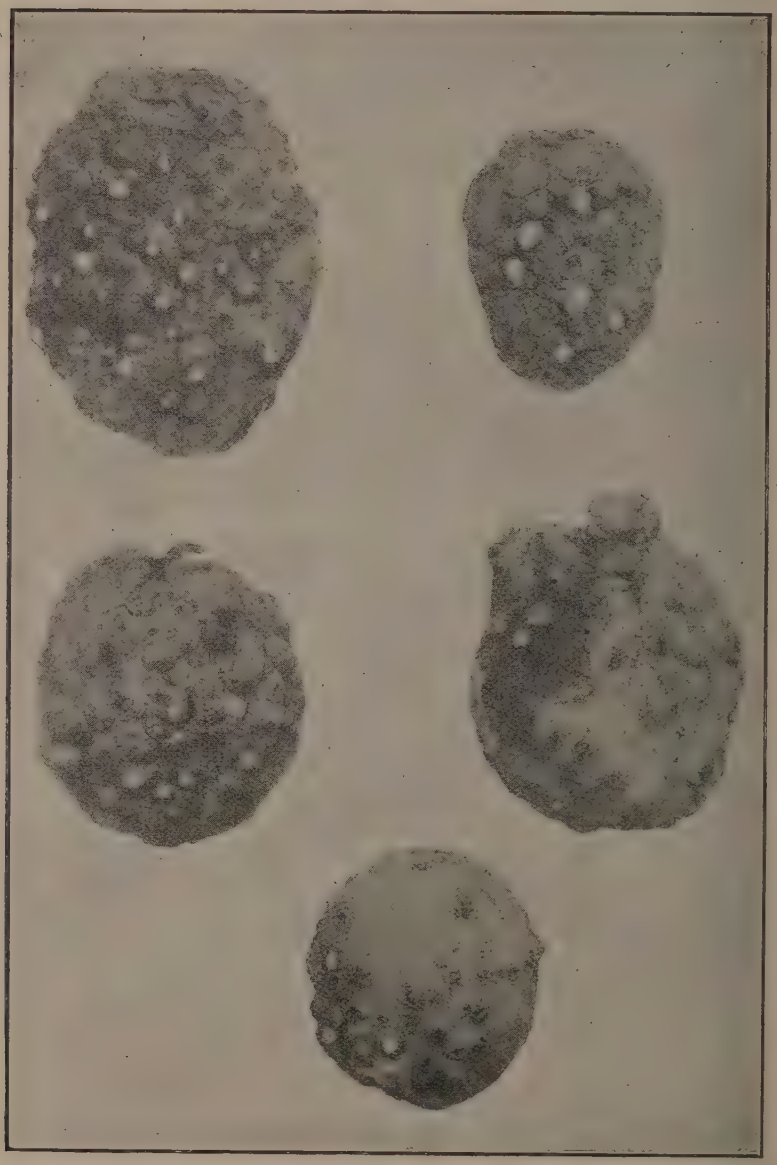


Fig. 2.

Eelworm-galls due to *Caconema* (*Heterodera*) *radicicola* on potato-tubers.

distribution of the worms, as they are not all destroyed by passing through the intestines.

Carrots, parsnips and other fleshy-rooted plants may show large warts which greatly disfigure the appearance of the edible portions (Figs. 3 and 4). On plants with more slender underground parts, the galls or warts may somewhat resemble the bacterial nodules which are so necessary a feature

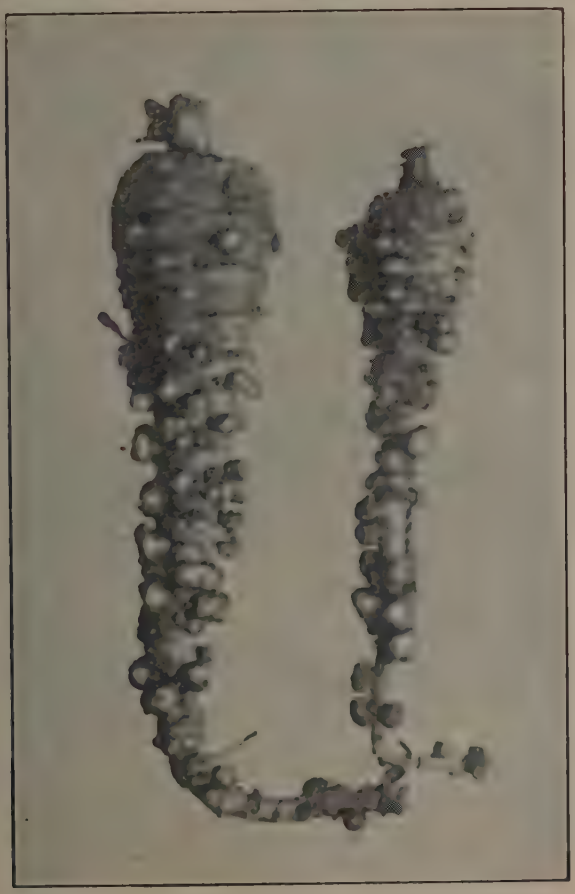


Fig. 3.

Eelworm-galls on parsnips.

Photo. by Author.

on the roots of plants belonging to the pea or bean family (*Leguminosae*). Even on such plants, however, the experienced eye soon learns to detect the eelworm-galls if present in addition to the bacterial nodules. The eelworm-galls on these plants are often very close to the root tips—they are mostly much more elongated, cylindrical and narrow than the bacterial nodules, and they follow the *length* of the roots or rootlets rather than jut

out as large swellings to the side, as do the nodules due to the bacteria. *They are, in short, on leguminous plants generally longitudinal swellings of the root* rather than more or less knobby lateral outgrowths. (Figs. 5 and 6). Plants of the cabbage family (*Cruciferae*) are sometimes attacked on the roots by the Club-root organism—*Plasmodiophora brassicae*—but the swellings in such a case are enormously larger and are easily distinguishable from eelworm-galls.

Life History.

The young eelworms or "larvae" which hatch out of the eggs laid in the old galls eventually puncture the roots of the host plant by means of spear-like structures in the mouth parts called *buccal-spears,* and enter into tissues of the root or similar part just behind the growing points. By their presence the root or tuber, etc., is stimulated to unusual activity and the characteristic galls result. On attaining full size the male and female eel-

Fig. 4.
Eelworm-galls on dahlia-tubers.
Photo by Author.

worms mate, and subsequently the female becomes greatly distended and may produce as many as five hundred eggs. In loose, warm, moist soils, up to twelve generations may be produced in a year, as the life cycle can, under such circumstances, be completed in four to five weeks. The "larvae" and adult males are elongated and like miniature earth-worms in shape, but the fertilized females are pear-shaped on account of the body being distended with eggs (Fig. 7).

Fig. 5.

Eelworm-galls on garden-pea. Note the long, sub-cylindrical nature of the galls. Several bacterial nodules occur at the points marked ×.

Photo. by Author.

Susceptible Plants.

For general information the following list of the most important susceptible plants is taken from Heald's "Manual of Plant Diseases":—

1. *Field crops.*—Alfalfa (lucerne), clover, cotton, cowpea (most varieties), sugar beet, sugar cane, sweet-potato, tobacco, and vetch.

2. *Ornamental and drug plants.*—Begonia, cineraria, clematis, coleus, dahlia, hollyhock, ginseng, golden seal, peony, rose, sweet pea, and violet.

3. *Truck crops.*—Asparagus, bean, beet, carrot, celery, cucumber, dasheen, eggplant, garden pea, lettuce, okra, onion, pepper, potato, rock-melon, salsify, spinach, strawberry, tomato, and water melon.

4. *Woody plants.*—Almond, catalpa, cherry, date palm, European elm, mulberry, grape, peach, pecan, walnut, and weeping willow.

Resistant Plants.

Nearly all grasses; cereals such as wheat, barley, oats, rye, maize, and sorghum; "Iron," "Brabham," "Monetta," and "Victor" cowpeas; peanut; "Laredo" soy bean; velvet bean.

CONTROL.

1. Farmers or householders should be very careful never to plant potato tubers or seedlings of any kind showing eelworm-galls. (The Potato Branch of this Department is taking every possible precaution to prevent the carrying of eelworm-infested plants into the potato-growing area of the Southwest, but an odd specimen or two might at any time find its way past the barriers.) *If your farm or home garden is free at present, do all you can to keep it free.* This means, among other things, raising your own seedings and boiling the peelings of any potato tubers used for household purposes which appear to be infested with eelworms. It is very likely that the eelworms have been chiefly carried about the State in potato tubers and introduced into the gardens and fields in the potato peelings. *The true seeds of plants as distinct from tubers, bulbs, etc., do not carry the eelworms.*

2. (a) In seedbeds the eelworms can be destroyed by treating the soil with *carbon-bisulphide* at the rate of 1½-2 ozs. per square yard before sowing the seed. Make four evenly-spaced holes 8 inches deep to every square yard of soil with a round stick. Into each pour, per medium of a funnel, approximately ¼-½ fluid ounce of the carbon-bisulphide and quickly cover with moist earth. Cover the seedbed with clean bags and leave for several days. Then aerate thoroughly by turning over several times and leaving stand for several days before planting the seed.

(b) Where carnations, dahlias and other flowering or ornamental plants in gardens are found to be attacked, the eelworms can be largely killed by treating the soil with *one fluid ounce carbon-bisulphide to the square yard in evenly-spaced holes not closer than 9 inches to the base of the plants.* After pouring the required amount down each hole (about ¼ ounce), close the hole with moist earth. The fumes will spread through the soil and kill many of the eelworms in the soil and roots. Both the above-mentioned treatments have been tested out over a considerable period of years by Mr. L. J. Newman, Economic Entomologist of this Department, with satisfactory results. Do not water the soil for several days after treating or the carbon-bisulphide may be forced out of the soil. **Above all, remember that carbon-bisulphide is exceedingly inflammable and explosive in the presence of a spark, lighted cigarette or flame. The fumes are also poisonous if inhaled for any length of time, so that the fumigant must be handled with all due discretion.**

(c) Experience in America and other countries indicates that *formalin* may be used fairly satisfactorily for treating eelworms in seed beds. The formula now being mostly recommended is 1 gallon of formalin to 50 gallons of water (*i.e.*, a so-called 2 per cent. solution). The solution is applied with a watering-can to the soil, which should previously have been well

Fig. 6.

Eelworm-galls on French bean.

Photo. by Author.

loosened up, at the rate of about ½-1½ gallons of the solution to the square foot (1). Cover the soil with bags moistened with the solution and leave for several days. Then remove the bags and stir the soil up thoroughly to let out the fumes. Leave for 10 days or a fortnight before sowing. This

treatment is exceptionally efficient for destroying such soil fungi as cause "damping-off" and "root-rot" and it also appears to give fairly good results with eelworms. Be careful, however, not to re-contaminate the soil by using dirty implements from infested ground, or by walking over the beds with contaminated boots, etc.

(d) Eelworms can be killed out by suffocation, if the soil in the seed-beds or field can be kept flooded with water for 3-4 weeks. In such a case, however, the soil must, of course, be freed of excess of water and well aerated before sowing the seeds or planting out.

(e) In many countries steam-sterilization is used to free the soil in glass houses from eel-worms, with extremely effective results, but the method is impracticable here.

(f) J. R. Watson (2), of the Agricultural Experiment Station, University of Florida, who has given considerable attention to the control of eelworms in the light sandy soils of Florida over many years, recommends a treatment for seed-beds from which the following details have been worked out (3). First of all, dig over the seed-beds thoroughly, then water with *sodium cyanide* solution at the rate of three ounces of the solid cyanide to each square yard of soil. Add further water until the soil is moistened to a depth of 18 inches throughout. Then *immediately afterwards* sprinkle four and a half ounces (4½ ozs.) of *sulphate of ammonia* over each square yard and water in with just sufficient water to carry the sulphate down. The two chemicals react with one another, forming sodium sulphate, ammonia, and hydrocyanic acid gas (prussic acid), which kills the eelworms. Watson (*loc. cit.*) states: "If nematodes (eelworms) appear at all in such seed-beds, they will be in isolated spots which can be rejected at planting time. If, on the other hand, the desire is for plants which can be depended upon to be absolutely free, as for setting in uninfested ground, application of at least 1,200 lbs. cyanide (of sodium) and 1,800 lbs. ammonium sulphate to the acre should be applied"—*i.e.*, about 4 ounces of the cyanide and 6 ounces of the sulphate of ammonia to each square yard.

Cyanide of potassium can be used instead of cyanide of sodium, and from the point of view of subsequent soil fertility, would appear to be considerably superior to the sodium compound. It has the disadvantage of greater cost, however, and, in addition, one must use one-third more of the potassium cyanide to each square yard, *i.e.*, 4 ounces, instead of 3 ounces of the sodium cyanide. The amount of sulphate of ammonia is, however, the same in each case. If the above method is used for sterilizing seed beds, **great care must be exercised in handling the cyanide as it is one of the most deadly poisonous substances known to science. In the case of poisoning, immediately give a weak solution of green sulphate of iron (ferrous sulphate or "green vitriol") as a drink, and then empty the stomach by means of a stomach tube or by inducing vomiting with a mustard emetic. Send post haste for medical assistance. Above all do not use the cyanide method unless you have a supply of the antidote ready in case of need and have carefully instructed all the persons concerned in its use. The poison is so powerful and rapid in its action that unless treatment is immediate there is very little hope.**

3. On a field scale every encouragement should be given to the plants in the way of water, organic matter, and fertiliser to enable them to stand up to attack. Tomatoes should be pruned to a single stem and tied up to

stakes. The reduction in the excessive top growth may then make it possible to obtain fairly heavy yields even though the roots are rather badly attacked.

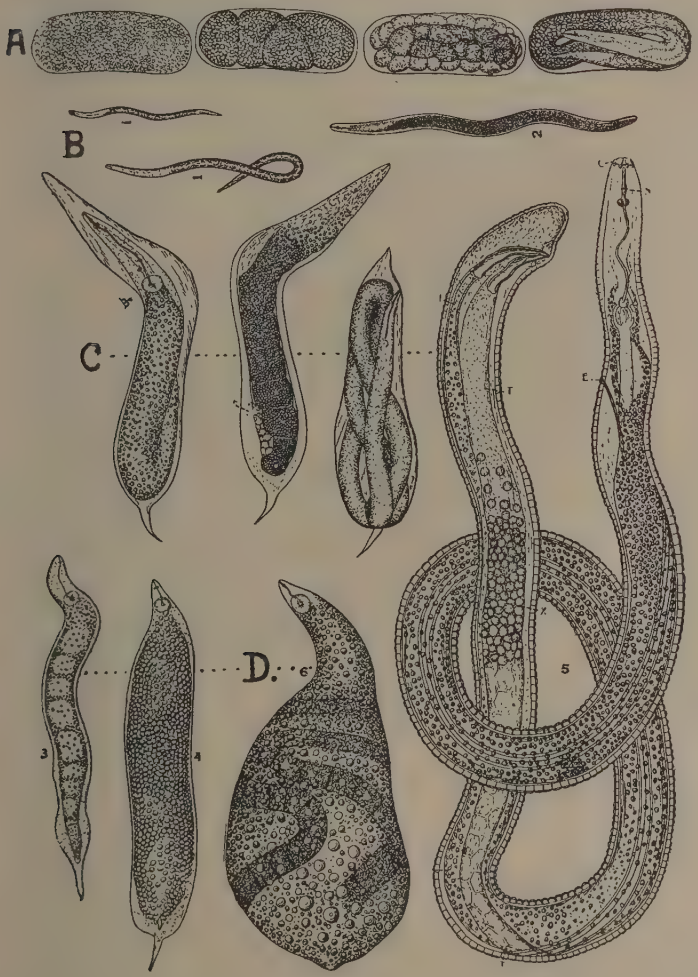


Fig. 7.

Life history of the eelworm, *Caconema* (*Heterodera*) *radicicola*. (Greef) Cobb.
A, Four stages in development of the egg.
B, Stages in the growth of young worms.
C, Four stages in development of male.
D, Three stages in development of female.
(*After Stone, G. E., and Smith, R. E., Mass. Agric. Expt. Sta. Bull.* 55, 1898.)

4. Where the soil *in the field* is badly contaminated with the pest, *well-worked summer fallow* should be practised, as in such a case the drying out of the soil kills great numbers of the parasites. The following season a

resistant crop (such as wheat or oats, etc.) should be sown, and then the susceptible crop can be sown with little fear the next season. This means that on badly infested tomato fields, for instance, the tomatoes should only be grown on the same land every third season. A division of the cultivated land into three more or less equal parts therefore seems imperative when the eelworms become firmly established. This means, of course, that the smaller area must be very intensively worked while it is in crop, but each year a comparatively clean area would be available for the main money-making plants. All weeds liable to harbour the worms should be prevented from growing along the headlands and ditches, etc.

5. Experiments recently reported by Edwards (4) in England indicate that good results might be obtained on a field scale by ploughing-in crude naphthalene to a depth of 6 inches, at the rate of eight hundredweights (8 cwts.) to the acre, followed by rolling, about a fortnight or so before planting. In the experiments referred to, very striking results were obtained in the treatment of a "potato-sick" soil where there was a very heavy mixed infestation of the soil with another species of eelworm, *Heterodera schactii*, and the fungus *Rhizoctonia solani*. The material actually used was "drained creosote salts" (stated to be a crude form of Napthalene), selling in England for about 10s. per cwt. Inquiries made in Perth indicate that the material cannot be obtained locally, but Messrs, De Merics, Ltd., of 255 George Street, Sydney, N.S.W., advise that supplies of a crude Naphthalene can be delivered by them f.o.b. Sydney at prices ranging from £16-£33 per ton, *i.e.*, 16s. to £1 13s. per cwt., according to the grade of purity. Even at the higher price an outlay of £13 4s. per acre should not be prohibitive, if good results were obtained, with such crops as tomatoes which in the Geraldton district are stated to sometimes give a gross return of over £500 per acre. Any farmers desirous of carrying out experiments could arrange for supplies in quantity from the firm mentioned. Experiments by the Department are projected to test the actual efficacy of the treatment for the local eelworm, *Caconema* (*Heterodera*) *radicicola*.

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CERTIFICATION OF SEED POTATOES.

REVIEW OF SEASON 1928-29.

W. E. COLLINS, Potato Inspector.

Before proceeding with the present review, it may not be out of place to outline the salient features of the Seed Potato Certification Scheme established by the Potato Branch in 1922.

The object of potato seed certification is to obtain good seed; that is, seed true to name, unmixed with other varieties, capable under good cultural conditions of producing high yields of marketable tubers. Seed to do this, must have come from stock that has itself performed well and has presented the properties that we expect of its product. It must be free to a large extent of those factors, particularly those of transmissable diseases, that are capable of reducing the yields.

With the increasing prevalence and number of diseases of potatoes, and the greater risk in purchasing seed stocks about which nothing is known by the purchaser, has come the realisation that the production of satisfactory seed requires special knowledge and care.

Consequently, there has been developed in this State during the past seven years a system of seed certification, designed to locate and make available to the seed buying public a supply or more or less standardised seed potatoes of good quality and productiveness: a service to judge what stock is good for seed, and to mark that stock in such a way as to assure those who purchase it, that it is good.

To accomplish this, crops entered for certification are inspected twice during the growing period, and again at digging and grading time by officers of the Potato Branch to determine as accurately as possible whether the potatoes come up to the required standard for Certified Seed.

The principal requirements are:—

1. Truéness to name.
2. A type true for the variety.
3. Relative freedom from disease.

The standard set is high enough to exclude all but first class stock, but not so high as to make it impossible or to discourage growers from attempting to grow good seed, but good seed must be produced before it can be certified to and there is a chance for much improvement yet.

Careful "rogueing" is insisted on and is absolutely necessary to produce high grade seed. The crops should be rogued not once, but a number of times during the growing season. Many Certified Seed growers have made the mistake of waiting until the plants are nearly mature before "rogueing," overlooking the fact that plants infected with certain diseases were thus allowed a long period to transmit the diseases to their healthy neighbours. Early "rogueing" will reduce the amount of disease in future crops.

An excellent opportunity offers the southern grower with his carefully racked seed, to minimise his weakly and abnormal plants by rejecting all doubtful tubers at the time of planting and satisfying himself by cuting a cross section at the heel end of the potato, that there is no internal discoloration, thereby reducing the possibility of "stem end" trouble. That the opportunity for the extension of potato seed certification is great, can be realised better when we consider that the total amount of certified seed produced last season would plant less than a sixth part of the potato acreage of the State. About 30,000 bags of seed are required to plant the potato areas of the southwest each year—5,000 bags of tubers were certified to in the past season—hence it is seen that there is still plenty of room for expansion in production of Certified Seed.

The benefits to potato growers from the planting of Certified Seed are so apparent, that extension in the movement is inevitable. We have but to see the failures in potato yields due to poor seed, to strengthen our belief.

Certified Seed necessarily commands a considerable premium over that which has not been inspected, but the extra cost is slight as compared to the increased yields which may be expected from the use of good seed, and the crop insurance which it affords. Certified Seed has in general justified the extra trouble and expense in producing it.

Naturally buyers are interested in knowing whether, aside from all theoretical considerations, Certified Seed actually yields more than common stock. In the Burekup-Roelands district where average yields from several certified and uncertified strains were taken, there was a gain of from 4-6 tons per acre for the Certified Seed. At Osborne Park Certified Seed averaged an increase of 5 tons to the acre.

These illustrations indicate that the principles on which seed potatoes are certified have a firm foundation. It is nevertheless, true that some lots of Certified Seed were not quite satisfactory. Such cases involved less than a ton of tubers and on examination, were found to be from quite uncontrollable causes.

For instance, there is on the surface of some tubers a black pitting of the skin known as "storage trouble," which, however, is not regarded as serious from a seed stand-point, unless the injury extends deeply, when the rotting of the set may occur. This trouble shows up irregularly in most potato growing areas of the State, and usually appears about 6 weeks after digging. There is no indication of the trouble during the growing period or at the time of digging. Very little of it is known actually, but with the assistance of the Government Plant Pathologist, who is now investigating it, a control measure may eventually be discovered.

Growers of Certified Seed are trying as never before, to improve on their efforts, and their Associations are zealous that the stock sent out under their name will be as nearly perfect as it is possible to grow it.

RED LEGGED EARTH MITE.

L. J. Newman, F.E.S.,
Economic Entomologist.

The past season has witnessed a very severe and widespread outbreak of this pest. The early Autumn rains brought out the mites from the over-summering eggs, during mild humid weather, which proved favourable to their rapid increase, hence the plague which has been experienced. The unfortunate position is that the hatching of the mites synchronises with the germination of the clover seeds. Early out of season rains do not cause the eggs to hatch. It appears to be necessary not only for the land to become moist, but the relative humidity and moisture saturation of the atmosphere must take place before the aestivating or over-summering eggs will hatch. This condition normally occurs about mid-May. The newly-hatched mites at once turn their attention to the young clovers and weed seedlings. This constitutes a very serious check upon their growth, as the chlorophyll or green matter of the leaf is removed. Since plants manufacture their food supply largely in their leaves, any excess foliage injury, particularly when young, will greatly reduce their vitality and crop return, and if persisted in will ultimately cause death.

Unfortunately, little heed is taken of the presence of the initial Autumn outbreak. It is not until mid-June that the seriousness of the trouble becomes really apparent. By this time a Winter generation has been produced, the mite appearing in countless myriads. A general outcry when it is too late is then made as to what can be done to stem the trouble. The young clovers when badly attacked, instead of growing and producing early feed, turn yellow and in many instances die. Potato and pea crops are invaded and become stunted, anl likewise ruined. In the flower and vegetable gardens the seedlings are attacked and so checked that the plants, at best, make a most disappointing showing. Growers in general become disheartened and disappointed. In small areas methods of control can be satisfactorily applied.

The big issue, however, in regard to this pest is the very serious damage done by it to our pastures. Clovers have undoubtedly proved to be most adaptable to our South-West, Avon Valley and Great Southern areas. By means of these legumes, supplemented by top dressing with manure, the cattle and sheep carrying capacity of these lands has been greatly increased. Subterranean Clover of various strains has proved the most prolific to date. Clovers, unfortunately, are particularly subject to insect attack. Not only is the mite seriously injuring them, but also two other pests, namely the Lucerne Flea and the Clover Weevil.

I do not wish to be regarded as a pessimist, as I do not doubt that ways and means to cope with these troubles will be found. Facing facts as they are at present I fear that we are placing all our eggs in one basket, so to speak, when we rely upon clovers as our main pasture crop. Clovers will, no doubt, always play an important part in the stock-carrying capacity of our lands. The time has arrived, however, when the need for more effort to establish mixed pastures should be made. Clovers, which at present in many districts constitute 80 per cent. of the pasture, are not in themselves from a dietetic point of view a complete food ration, hence the need for growing other crops which are not relished by these pests.

Cereal crops are not seriously menaced. Oats are attacked but appear to outgrow the trouble. Wheat is practically immune from attack. Should the pest increase its attack upon cereals, it can be controlled by fallowing. The mite is particularly bad in the Avon Valley and Great Southern areas. The coastal country and the South-West are also infested, but in these districts its ravages have not generally been so disastrous, owing to the fact of the milder climate inducing a more rapid growth.

Several outbreaks have been recorded in the Wheat Belt. The pest generally orginates in the home garden, where it has been introduced per medium of seedlings or cuttings from infested gardens. The mite has a great variety of host plants, being most cosmopolitan in its tastes. This fact renders its control doubly hard. Cape weed, Chick weed and many others are prolific carriers of the pest. The incidence of this plant-feeding mite has entailed much work upon the Entomological Staff in studying its life history and habits. A great deal of time has also been devoted to devising ways and means for its prevention and treatment.

Prevention.—Having proved that the mite is carried over from late Spring to Autumn per medium of aestivating or over-summering eggs, the following advice is tendered. *The most important means of control is to place the land to be cropped the next Autum under clean fallow during the previous Spring.* Land to be so treated should be heavily stocked to eat down all feed present. This will enable the land to be ploughed with greater certainty of turning under completely all growth. The fallow must be kept free of any further growth until worked and resown the following Autumn. The land should be cultivated down to a good tilth with a compact sub-surface. *If the fallowing is done early enough, that is, before the dry weather sets in, there should not be any over-summering eggs present.* Allow at least two weeks to elapse after the first Autumn rains before harrowing and re-sowing the crop, which should be clovers and other approved pasture plants. This period after the rains will permit of any mite eggs that may be present to hatch in the impacted sub-surface soil, where they will die owing to being unable to reach the surface. If this method, which is recommended every third or fourth year, does not prove 100 per cent. effective, it will at least so check the pests that it will ensure the life of the pasture for a period of three or four years. By the end of this time it is quite possible the mite and other insect pests will have again increased to plague form, necessitating a repetition. The turning over of the land not only assists in the checking of the insects but also improves the growth and feeding value of the following crops.

Autumn Treatment.—If the land has not been placed under fallow the previous Spring a good check can be administered by thoroughly ploughing and turning in the young mites. These mites arise from the over-summering eggs and will hatch about two weeks after the first genuine Autumn rains. It is most important to take action, whether it be ploughing, dusting or spraying, to check this pest, before Winter eggs have been laid. The Winter eggs are laid upon the foliage. Infinitely better results will follow action taken then than later, when myriads of winter eggs have been deposited. Two weeks, therefore, after the first mites are observed, ploughing and other treatments should be undertaken. Ten days after preparing the land the crop can be sown. *As a further protection against invasion* from contiguous infested areas, keep a strip of cultivated land about 20 feet wide around the crop. The mites cannot readily pass over a loose buffer.

The fact that the mite floats in myriads on the surface of running water is a factor that has to be considered. A portion of land that has been treated as before described may be re-infested by the introduction of the mite from continguous infested areas by this means. It is, therefore, essential to see that any running water is diverted by means of drains from the land to be protected. *The use of forcing manures as the first top dressing of the pasture in the Autumn is advised.* This will assist the young seedling plants to grow rapidly and thus get ahead of the mite. If this growth can be maintained, then there is a good chance of the damage now suffered being greatly reduced. If the seedling plant growth is slow, the mites are able to destroy the leaves more rapidly than they are produced, hence many plants die, or their growth is so retarded that they are rendered useless as early winter feed. Later on, as the weather warms up in the Spring, they may eventually outgrow the attack. One of the principal objects of growing clovers, however, is to obtain early feed. *Never transfer seedling plants or cuttings from a mite infested area to a clean one.* This is one of the most prolific means of spreading the pest. It will always pay to raise one's own plants from seed. *Sheep are also spreaders of the mite.* The mites crawl on to the sheep whilst feeding or lying down. The sheep are then moved to another paddock or may even be transported some considerable distance. A fresh outbreak of mite is then established and hence by these means this wingless creature is spread.

Treatment.—During the past few years a great deal of experimental work against this pest has been done, with the view of finding the most economical means of combating it. The difficulty lies in the widespread nature of the trouble. Not only are the garden and useful pasture plants attacked, but all kinds of weeds are used as host plants. The question is one of economics. The cost of so many sprays and dusts that would effectively kill the mite render their use over large areas out of the question.

Over crops such as potatoes and vegetable home gardens, and limited pasture areas, the following sprays or dustings may be used:—

Phenyle.—1 part to 80 parts of water, sprayed on to the mites will destroy all those brought into contact.

Izal at the rate of one part to 250 parts of water will likewise act as a contact killer.

Black Leaf 40, 1 lb.. soap, 3 lbs.; water, 70 gallons, is an effective spray. For small lots take one teaspoonful of Black Leaf 40, one ounce of soap to one gallon of water.

Kerosene and Naphthalene Emulsion is good. Kerosene two gallons; soap half a pound; Naphthalene half an ounce. Dissolve the Naphthalene in the kerosene, shred the soap and boil in one gallon of water. Remove from fire and add the kerosene-naphthalene, churning violently for 8 to 10 minutes. This will form an emulsion, which thickens on cooling. When using take one part of this stock to 8 parts of water.

As a dusting powder mix the following:—1 lb. of 15 per cent. Carbolic Powder; 4 lbs. Superphosphate or other finely ground manure. These are thoroughly mixed, giving a 3 per cent. carbolic content. Use as a top dressing at the rate of at least one cwt. per acre. The Carbolic powder may be used with lime, tobacco dust, or other suitable diluent. The advantage of

using the manure mixture is that it combines a fertiliser and mitecide: thus not only killing the mite but in the same act, and at the one cost for labour, manuring the crop.

A dusting for gardens can be made by taking the following:—Half a kerosene tin of lime and half a kerosene tin of tobacco dust. Thoroughly mix and add half a pint of kerosene. This is again mixed and allowed to stand overnight.

Burning Off.—If possible, the passing of a good fire over an infested area is advised. This will destroy the over-summering eggs. The burn must be a hot one, otherwise the effect will be only partial. The need for the conservation of fodder renders this method impossible in most cases. When eaten down as most pastures are, it is not possible to get a good running fire.

Biological Control.

Very little appears to be known of natural enemies of the mites. Every effort is being made to discover any predatory parasites. To this end communication has been opened up with entomologists in various parts of the world. Biological control may some day be successfully employed, but to date no effective parasite has been discovered. This mite has now established iteslf throughout the Commonwealth and is a national problem.

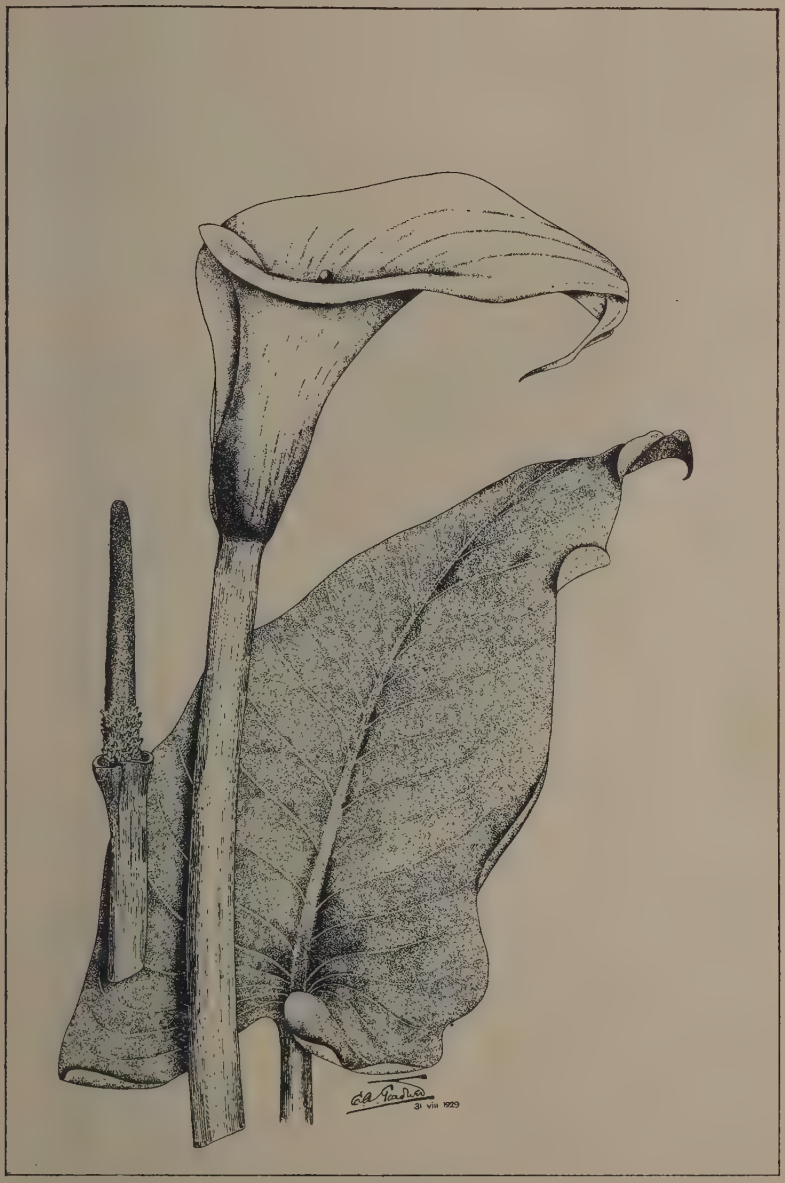
THE ARUM LILY.

(*Zantedeschia aethiopica,* Spreng.)

C. A. GARDNER,
Government Botanist.

The Arum Lily, familiar to most people as a much cultivated ornamental plant, has become naturalised in the wetter parts of Western Australia, finding a congenial environment in the black mud of several swamps in the older settled parts of the South-West, between Armadale and the Margaret River district. Especially is it abundant around the Vasse and Margaret Rivers, being in the spring, one of the features of the swampy areas. This plant is not a true lily, but belongs to the Arum family, and the so-called flower is not a flower, but a modified leaf or spathe which envelops a spadix or spike which contains many closely packed flowers of both sexes, the males being uppermost, the females below. Both flowers are destitute of corollas or perianths.

Originally native to South Africa, the Arum Lily has been introduced into many countries. In its native land it is known as the Pig Lily, and abroad is often spoken of as the "White Calla." In Western Australia it is stated that pigs feed on the rhizomes, but whether or not they are nutritious is a matter of doubt. Many plants of this family contain what is believed to be a saponin, a poisonous principle which acts as an irritant when in contact with the mucous membrane. This causes inflamation at the back of the mouth, and the tongue swells. Salivation follows, and diffi-



Arum Lily.

culty in swallowing is experienced. There is a case on record when a man in Perth, who accidently chewed part of the rhizome of this plant, was seriously ill for some time. Animals have been poisoned through eating species of *Arum*, a genus allied to *Zantedeschia*, but there are no authentic cases on record regarding our plant.

Description of Plant.

A perennial herbaceous plant with rhizomes. Leaves all basal, on long petioles, the blade cordate-ovate or sagittate-ovate, up to two feet in length. Peduncles exceeding the leaves, and appearing later than them, bearing a large white or creamy-white trumpet-shaped spate 5 to 10 inches long, with a broad limb and long recurved cusp; spadix yellow, shorter than the spathe, pistillate (*i.e.*, female) in the lower part, staminate (*i.e.*, male) in the upper part, containing numerous densely-packed flowers; stamens 2-3, free; ovary 1 or more celled, ovules usually 4 in each cell. Fruit berry-like, enclosed in the spathe. The plant is also known as *Richardia aethiopica*, or *Richardia africana*. The flowering season in Western Australia extends from August to December. Occasionally the plants have double spathes, and under cultivation, sometimes triple spathes.

This plant should not be encouraged in damp muddy soils, or in swampy localities. It may spread and choke out more valuable plants, such as white Dutch clover, Lotus or Paspalum. Eradication is difficult, but for small areas digging out is to be recommended.

HAND FEEDING OF SHEEP AT THE CHAPMAN EXPERIMENT FARM.

SUPPLEMENTS TO NATURAL SUMMER PASTURE.

F. L. SHIER, B.Sc.(Agric.),
Agricultural Adviser.

In order to study the effect of supplementing the dry natural pasture and stubble at the Chapman Experiment Farm, an experiment was conducted with a portion of the farm flock. Three even lots, each of 20 merino ewes mated to merino rams on the 1st November, 1927, were paddocked and fed as follows:—

Lot 1.—Dry pasture supplemented by a daily ration of ½ lb. whole oats, plus ½ lb. chaffed oaten and wheaten hay mixed.

Lot 2.—Dry pasture supplemented by ½ lb. of whole oats, plus 1½ lbs. of oaten and wheaten silage.

Lot 3.—Dry pasture only.

The dry pasture consisted mainly of wheaten and oaten stubble, together with a certain amount of Burr Trefoil and Cape Weed.

The silage was a mixture of unchaffed wheat and oat crops which had been cut at the hay stage, and pitted in a small trench silo during September, 1927. The trench was opened the last week in January, 1928, when the silage was found to be of good quality. Owing to the material being in the long state when ensiled, a certain amount of wastage occurred in the process of feeding it to the sheep. The amount of succulent silage given (1½ lbs.) was considered to approximate roughly the feeding value of the weight of the dry hay fed, viz., ½ lb. to Lot 2. On the 1st February, in

order that they should be under the same conditions as would obtain during the course of the experiment, the sheep were drafted out as follows:—

Lots 1 and 2 were confined in two small paddocks, each of three acres. The dry pasture consisted mainly of wheaten stubble, together with a certain amount of dry Burr Trefoil and Cape Weed. During the course of the experiment further supplies of wheaten hay were made available, but were not eaten by the sheep.

Lot 3 was placed in a 47-acre paddock containing wheaten and oaten stubble and a considerable amount of Burr Trefoil.

Throughout the experiment the sheep had access to a mineral lick, considerable quantities of which were consumed. The composition of the lick was as follows:—Coarse salt, 40 parts; slaked lime, 10 parts; superphosphate, 1 part.

A plentiful supply of good stock water was available in each paddock.

The experiment commenced on 14th February, the initial weighings being carried out on that date in the manner described in Bulletin 87 of this Department.

Lambing commenced during the second period between 12th March and 16th April, but the bulk of the lambs were dropped between 16th April and 28th May.

At the conclusion of the experiment the following lambs had been recorded.

Lot 1.—15 lambs, 3 of which were killed by crows.
Lot 2.—13 lambs, 5 of which were killed by crows.
Lot 3.—12 lambs, 3 of which were killed by crows.

Subsequent to the termination of the experiment, one lamb was dropped in Lot 1 and four in Lot 3.

The sheep were weighed on 12th March, 16th April, and the 20th May, the experiment being terminated on the last-mentioned date.

The weights recorded are given in the following tables:—

TABLE I.

SHEEP FEEDING EXPERIMENT.

No. 1 LOT.

Ration, ½lb. Chaff and ½lb. Oats daily per Sheep.

No. of Ear Tag.	1st weighing 14th Feb.	2nd weighting 12th Mar.	Loss or Gain after 1 month.	3rd weighing 16th April.	Loss or Gain after 2 months.	Last weighing 28th May.	Loss or Gain after 3 months.
135	84	90	+6	92	+8	91	+7
136	95	102	+7	104	+9	84	—11*
137	79	82	+3	84	+5	82	+3
138	98	99	+1	102	+4	98	*Nil*
139	101	109	+8	109	+8	93	—8*
140	99	107	+8	112	+13	92	—7*
141	90	106	+16	110	+20	96	+6*
142	110	113	+3	118	+8	92	—18*
143	95	101	+6	104	+9	90	—5*
144	100	111	+11	112	+12	101	+1*
145	107	112	+5	112	+5	109	+2
146	103	111	+8	117	+14	98	—5*
147	107	108	+1	111	+4	108	+1
148	101	111	+10	109	+8	98	—3*
149	104	111	+7	96	—8*	84	—20
150	112	125	+13	132	+20	95	—17*
151	117	122	+5	128	+11	112	—5*
152	92	104	+12	107	+15	94	+2*
153	96	101	+5	104	+8	86	—10*
154	92	103	+11	104	+12	80	—12*
Averages	99·10	106·40	+7·30	108·35	+9·25	94·15	4·95

* Denotes Ewes which had lambed since last weighing

TABLE 2.

SHEEP FEEDING EXPERIMENT.

No. 2 LOT.

Ration, ½lb. Oats and 1½lbs. Silage per day per Sheep.

No. of Ear Tag.	1st weighing 14th Feb.	2nd weighing 12th Mar.	Loss or Gain after 1 month.	3rd weighing 16th April.	Loss or Gain after 2 months.	4th weighing 28th May.	Loss or Gain after 3 months.
175	99	98	—1	102	+3	92	—7*
176	111	122	+11	122	+11	106	—5*
177	108	119	+11	120	+12	95	—13*
178	110	115	+5	115	+5	100	—10*
179	121	133	+12	122	+1*	112	—9
180	91	102	+11	101	+10	100	+9
181	108	118	+10	84	—24*	90	—18
182	104	107	+3	122	+18	86	—18*
183	106	112	+6	120	+14	127	+21
184	92	103	+11	101	+9	100	+8
185	122	130	+8	134	+12	112	—10*
186	108	118	+10	118	+10	98	—10*
187	98	114	+16	118	+20	94	—4*
188	95	102	+7	102	+7	102	+7
189	89	95	+6	96	+7	90	+1*
190	86	97	+11	98	+12	98	+12
191	77	85	+8	84	+7	85	+8
192	82	91	+9	98	+16	92	+10
193	76	79	+3	79	+3	78	+2
194	89	92	+3	75	—14*	66	—23
Averages	98·60	106·60	+8·00	105·55	+6·95	96·15	—2·45

* Denotes Ewes which had lambed since last weighing.

TABLE 3.

SHEEP FEEDING EXPERIMENT.

No. 3 LOT.

Ration—Natural Pasture.

No. of Ear Tag.	1st weighing 14th Feb.	2nd weighing 12th Mar.	Loss or Gain after 1 month.	3rd weighing 16th April.	Loss or Gain after 2 months.	Last weighing 28th May.	Loss or Gain after 3 months.
155	90	92	+2	100	+10	108	+18
156	106	109	+3	105	+9	120	+14
157	97	99	+2	114	+17	96	—1*
158	92	92	*Nil*	102	+10	84	—8*
159	120	117	—3	134	+14	106	—14*
160	104	104	*Nil*	108	+4	110	+6
161	94	96	+2	96	+2*	98	+4
162	103	107	+4	96	—7	91	—12
163	97	99	+2	105	+12	88	—9*
164	114	108	—6	118	+4	98	—16*
165	92	98	+6	108	+16	114	+22
166	97	100	+3	104	+7	104	+7
167	98	92	—6	105	+7	84	—14*
168	104	101	—3	101	—3	90	—14*
169	95	97	+2	108	+13	96	+1*
170	90	91	+1	106	+16	106	+16
171	87	87	*Nil*	90	+3	98	+11
172	83	75	—8	80	+3	92	+9
173	103	109	+6	120	+17	110	+7*
174	104	106	+2	108	+4	112	+8
Averages	98·50	98·95	+0·45	105·90	+7·40	100·25	+1·75

* Denotes Ewes which had lambed since last weighing.

The following table summarises the results shown in Tables 1, 2, and 3, and separates the ewes which did not lamb from the ewes which did.

TABLE 4.

Losses or gains of the Ewes which lambed and the Ewes which did not lamb during the course of the experiment.

Date of weighing.	Lot 1.		Lot 2.		Lot 3.	
	Ewes (15) which lambed during the experiment.	Ewes (5) which did not lamb.	Ewes (12) which lambed during the experiment.	Ewes (8) which did not lamb	Ewes (10) which lambed during the experiment.	Ewes (10) which did not lamb.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
12th March ...	+8·6	+3·2	+7·8	+8·3	—0·4	+1·3
16th April* ...	+10·6	+5·2	+5·1	+9·8	+8·9	+4·9
28th May ...	—7·5	+2·6†	—10·5	+9·7	—6·4	+9·9‡

* Prior to this date, one Ewe had lambed in Lot 1, three in Lot 2, and one in Lot 3. † One Ewe lambed subsequently. ‡ Four Ewes lambed subsequently.

Attention is drawn to the weights of the ewes from the first section of each lot, recorded on the 16th April, which had not lambed prior to this date. These are as follow:—

	Ewes not yet lambed.	Gain or Loss. lbs.
Lot 1	14 ..	+ 11.9
Lot 2	9 ..	+ 10.9
Lot 3	9 ..	+ 9.7

Conclusions.

1. Hand-fed ewes improved in weight earlier in the season than those receiving no supplement.

2. Ewes receiving supplementary feed, especially those receiving silage, lost in weight to a significantly greater amount at lambing than did those on natural pasture alone. This suggests that bigger and more vigorous lambs were produced on the supplemented diet, especially where silage was used as the supplement.

3. Dry ewes fed silage as a supplement made substantially greater gains than did those ewes receiving chaff as a supplement.

Note.—This comparison could not be extended to Lot 3, as four of these ewes lambed shortly after the termination of the experiment.

ONION WEED.

(Asphodelus fistulosus, *Linn.*)

C. A. GARDNER,
Government Botanist.

This is not one of the proclaimed noxious weeds, but is, notwithstanding, a serious weed in some parts of Western Australia. It is a perennial herbaceous plant of the Lily family, which has been naturalised for many years, coming originally from the Mediterranean region.

Description of Plant.

Roots long and fibrous, with no taproot; stem hollow, usually branching above. Leaves all radial, long, cylindrical, striate, hollow, more or less succulent; flower-buds pink, flowers white, with six divisions, all spreading, and with a purple central nerve, arranged in long racemes; pedicels jointed, with a narrow bract at the base; stamens six, inserted at the base of the segments, their broad papillose bases encircling the ovary, thickened above, the anthers opening inwards; style rather slender with a three-lobed stigma. Fruit a 3-celled capsule opening loculicidally by three valves which retain the partition down the middle, containing 3 to 6 triangular black wrinkled seeds. The flowering season is between July and November.

This plant is probably the Asphodel of classic literature.

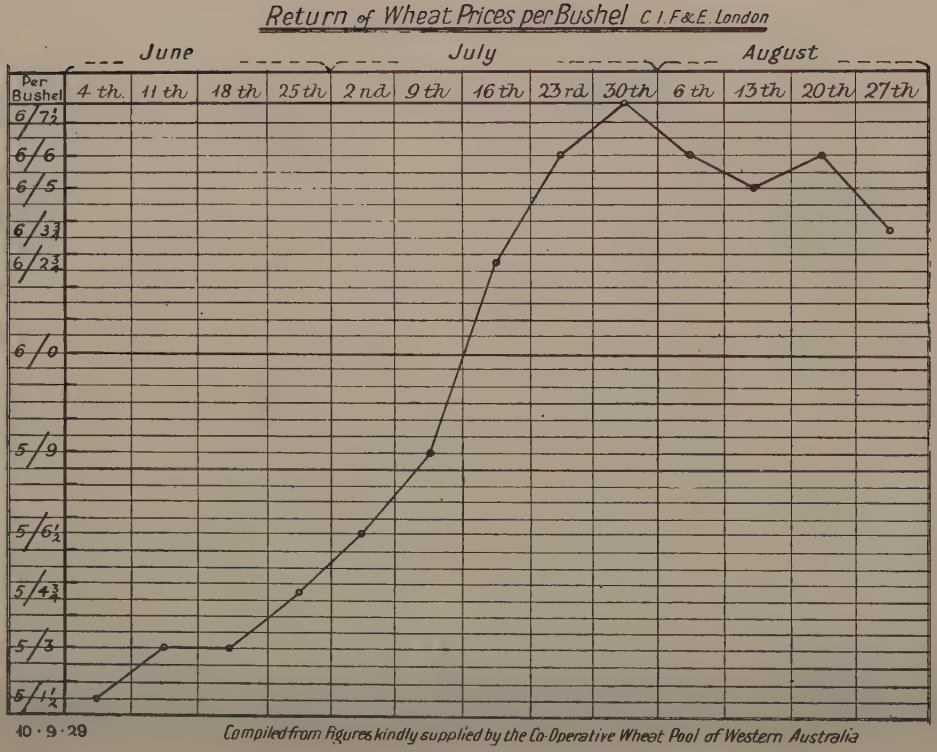
Onion weed is not poisonous, but is disliked by stock. The ingestion of the plant by cows is said to impart an offensive odour and flavour to milk. Besides being perennial, the plant spreads by reason of the numerous seeds produced. In Western Australia it appears to favour limestone country, and is therefore common around Perth and Fremantle, the coastal country to the South, and the vicinity of Esperance. It is also common around Bunbury and on Rottnest Island. It appears to be spreading further inland from these old established areas, and tends to take possession of the land wherever it obtains a footing. Since stock rarely touch it, it is to be regarded as a serious weed where it occurs in pasture lands.

In eradicating Onion Weed it is important to commence operations when the plant commences to flower. At this stage hoeing or forking the plants from the soil is particularly fatal. Cultivation will suppress it, but the plants should be collected with care, since the plant is a succulent and may, therefore, live for several days after being uprooted, and re-establish its roots if left on the surface.

Onion Weed.

EXPLANATION OF PLATE.

A. Plant (½ natural size).
B. Flower (enlarged slightly).
C. Pistil.
D. Capsule.


Return of Wheat Prices per Bushel C.I.F.&E. London
June
July
August
Per Bushel
4th.
11th
18th
25th
2nd
9th
16th
23rd
30th
6th
13th
20th
27th
6/7½
6/6
6/5
6/3¾
6/2¾
6/0
5/9
5/6½
5/4¾
5/3
5/1½
10·9·29
Compiled from figures kindly supplied by the Co-Operative Wheat Pool of Western Australia

PRODUCERS' MARKETS, LTD.

REPORT FOR QUARTER ENDING AUGUST 31st, 1929.

Fruit for the months ending August 31st was well supplied with all varieties in season. In the early part only moderate supplies of tomatoes ex Geraldton came forward; they have since increased in volume and eased in price. All lines of navels have improved in value although last year's prices were not obtained, owing to much larger quantities being placed on the market this year. Oranges (plain) have also improved and realised up to 11s. for ¾-bushel cases, but the best quality has yet to come forward. All lines of sweet mandarins sold very satisfactorily throughout. Lemons have been very unsettled owing to weather conditions; during the month we realised up to 12s. 6d. ¾ cases for prime lines.

From the beginning of the month there has been a rapid improvement in prices for all prime lines of apples, the demand for prime Yates being greater than the supply—realising from 19s. to 23s. 9d.; Granny Smiths up to 21s. 9d. next in demand. All prime lines of Delicious met competition up to 21s. 6d.; these must be nicely coloured to realise good prices. Prime Dunn's Seedlings are getting scarce, also Cleopatras; Statesmen, Stewarts, Jonathans, and all other varieties 2½in. upward have realised very satisfactory prices.

Only a moderate supply of pears has come forward. Ex cool store up to 13s. for ¾-bushel cases. Supplies of cape gooseberries are below the demand, and are realising good values. Passion fruit increase in volume, easing slightly. There is only a medium supply of grapefruit which realised high prices up to 22s. 6d. for ¾ cases.

Vegetables.—At the beginning of the period heavy vegetable supplies were marketed.

Cauliflowers were over supplied, and while prime lines sold at fair values inferior lines were heavy and unsaleable. Cabbage values suffered in consequence.

Bunch lines were in keen demand, beetroot and lettuce touching very high prices. Potato lines were short and values firmed. Peas and beans of the first crop made their appearance and realised high prices. In July changes as to quantity and quality were noticeable. Bunch lines increased in volume and prices came down to their normal value. Cauliflower supplies eased to an improvement in values, and cabbage firmed accordingly. Peas and beans remained firm, and potatoes were short with values rising. Pumpkins were steady and only prime swedes were in demand.

In the last month of the period bunch lines remained steady. The second crop of cauliflowers caused values to ease with this variety. Potatoes were very short and values very firm, as high as as 40s. per cwt. being paid for prime quality. Peas increased in volume, supplies forward mainly from the Geraldton district. Pumpkins and swedes were steady. Briefly, supplies have been steady and values satisfactory throughout.

Poultry.—Early in June good supplies of poultry came forward, with high values ruling for all prime lines. The volume increased towards the middle of the month so that the value of turkeys receded slightly and im-

proved towards the end, while Muscovies were well supplied. By the end of June these were realising 13s. to 14s. 6d., and turkey gobblers from 35s. to 41s. The market fluctuated during July with a very keen demand for prime cockerels, Muscovy drakes and heavy hens. Turkeys eased slightly and sold at 30s. to 35s. Young chickens came forward much earlier than usual, and we were able to offer reliable lines to country buyers. During mid-July the demand became somewhat weaker in comparison with the heavy supply, though heavy turkeys were in excellent demand, and at the end of July supplies were not equal to the demand. In August there was a keen demand and a good supply coming forward. Good turkeys realised 39s. 6d. to 45s., while prime Muscovy drakes brought from 14s. 9d. to 15s. 9d., and Muscovy ducks 8s. 6d. to 10s. 6d. All through the month the supply of poultry was plentiful to a keen demand.

Eggs.—The egg supply began to increase at the beginning of the quarter, and prices ranged from 2s. 4d. to 2s. 7d. for new-laid metropolitan. Duck eggs realised 2s. 1½d. to 2s. 4d. The heavy demand at the end of June kept prices to 2s. 1½d. for guaranteed new-laid. During July supplies increased to a falling market, and new-laid only realised 1s. 8½d. to 1s. 11½d., and by the end of the month they were only realising 1s. 6d. for metropolitan, and country new-laid were 1s. 4d. to 1s. 6d., and clients were urged to pack for export.

Eggs intended for export should weigh from 1⅞ oz. to 2⅛ oz., and should be clean and sound in shell. An egg-cleaning machine has been installed, and it is hoped that this will facilitate the export of our surplus eggs. Large quantities were being pulped towards the end of August, and growers were strongly urged to pack 1st grade eggs for export. A shipment of eggs left for London during the month.

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder Smith & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK YARDED AT METROPOLITAN FAT STOCK MARKETS, JUNE, JULY, AUGUST, 1929.

	June.				July.					August.			
	5th	12th	19th	26th	3rd	10th	17th	24th	31st	7th	14th	21st	28th
Sheep and Lambs	7,339	9,425	10,330	10,845	10,538	11,884	12,833	8,850	9,781	10,228	11,847	13,964	14,59 6
Cattle ...	446	597	673	703	541	808	860	757	*874	907	810	805	830
Pigs ...	544	450	488	707	437	566	478	394	521	572	682	630	795

* 378 stores.

COMPARATIVE VALUES PER POUND OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS DURING JUNE, JULY, AUGUST, 1929.

	June.				July.					August.			
	5th.	12th	19th	26th	3rd	10th	17th	24th	31st	7th	14th	21st	28th
Mutton ...	11½	11½	11	10½	9¾	8½	8½	9	9	9½	9½	9½	7½
Beef ...	8½	7½	7½	8	8½	7½	6½	6¾	7½	6¾	6½	6	5½
Pork ...	13½	13½	13½	12½	12½	12½	12½	12	11½	11½	11	10½	10½
Bacon ...	10¾	10¾	10¾	10½	10½	10½	10	10	10	9¾	9¾	9½	9½

MARKET REPORT.

Messrs. H. J. Wigmore & Co., Ltd., of Wellington Street, Perth, have supplied us with the following information regarding Chaff available at the Metropolitan Chaff and Grain Auction Sales, held in Perth for the period of June to August (inclusive). In all cases the prices quoted are for F.a.q. to Prime Wheaten Chaff packed in new bags.

Wheaten Chaff.—Supplies arriving during June were rather more than ample to meet requirements and values greatly declined. F.a.q. to Prime, at the latter part of the month, being £5 10s. 0d. per ton. This price did not show any inducement to holders to market and with small yardings the value showed a set improvement, the following being closing quotations.

Quantity	Maximum	Minimum.
750 tons	£6 0 0	£5 5 0

July.—Supplies of Chaff arriving were sufficient to meet the demand and the market was steady.

Quantity	Maximum	Minimum.
850 tons	£6 10 0	£5 15 0

At the beginning of August, supplies arriving were rather short, there being an enquiry from the Eastern States, a considerable quantity being shipped, which had a tendency of firming the market to £6 12s. 6d. per ton. Rain was experienced in the Eastern States and enquiries consequently ceased, with a proportion being cancelled and we again experienced heavy yardings at the latter part of this month, when the market eased to £5 15s. 0d.

Quantity	Maximum	Minimum.
950 tons	£6 12 6	£5 15 0

Oaten Chaff.—Consignments throughout the period under review have not been heavy, but the demand has been far from bright, and the prices have fluctuated more or less in sympathy with the price of Wheaten, F.a.q. being worth from £5 7s. 6d. to £5 10s. 0d. per ton, Medium qualities selling at from £5 0s. 0d. to £5 5s. 0d. per ton. During the latter part of August, the market eased, F.a.q. selling at £5 5s. 0d. to £5 7s. 6d. and Medium qualities at £4 10s. 0d. to £4 15s. 0d. per ton.

Oats.—Good supplies have been finding their way to market and with rather a poor demand values eased somewhat and good heavy feed Algerian and Guyras realised from 2s. 7d. to 2s. 7½d. per bushel. Exceptional quality up to 2s. 9d. per bushel and medium feed at 2s. 5½d. to 2s. 6d. per bushel, light feeds at from 2s. to 2s. 3d. per bushel.

Wheat.—During the month of June, after the seeding was completed, good supplies of surplus seed were arriving, F.a.q. realising 4s. 3d. per bushel and quality approaching this at 4s. 2d. per bushel. Drought conditions at a critical period in Canada have been largely responsible for the sharp rise that has taken place in the World's market. Whereas a few weeks ago, Wheat was difficult to dispose of at lower figures, we are pleased to report that this market has firmed considerably, F.a.q. realising from 5s. 3d. to 5s. 5d. per bushel, with an occasional truck of prime milling quality at 5s. 6d. per bushel, smutty and inferior at lower rates according to sample.

METEOROLOGICAL INFORMATION.

STATIONS.	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	JUNE, 1929.						JULY, 1929.						AUGUST, 1929.					
					inches.	inches.					inches.	inches.					inches.	inches.
Chapman State Farm	65·8	74·6	47·5	37·4	6·43	4·08	63·8	68·8	43·2	37·8	1·89	4·06	65·5	79·0	45·9	38·6	1·90	2·71
Geraldton	68·0	78·5	53·6	44·8	7·88	4·70	65·6	69·0	50·5	39·3	3·20	3·91	67·7	78·0	52·0	43·4	1·56	2·90
Walebing	61·3	70·4	43·7	34·0	7·41	3·91	59·6	65·4	40·5	33·4	3·71	3·72	62·1	77·0	42·0	34·2	2·61	3·03
Perth	62·6	72·8	48·9	38·0	9·23	6·77	61·2	66·9	46·6	40·0	5·29	6·52	63·5	76·5	48·6	42·0	3·34	5·62
Kalamunda	63·3	73·0	48·2	38·0	11·79	7·92	60·5	66·0	44·6	40·0	4·70	8·30	62·9	76·0	44·9	39·0	4·15	6·99
Bunbury	62·0	68·2	47·0	34·5	11·39	7·13	61·0	66·2	44·9	34·2	4·44	6·98	62·5	72·0	46·4	36·0	3·00	5·40
Bridgetown	59·5	67·0	41·0	31·0	7·45	5·78	58·6	64·0	39·2	28·0	3·28	5·83	60·6	75·0	38·8	30·0	3·42	5·15
Albany	59·9	66·5	46·7	40·0	6·18	5·50	59·1	65·0	46·3	40·0	5·46	5·54	59·3	66·5	45·5	41·0	3·93	5·21
Merredin State Farm	59·1	70·0	43·6	32·6	3·09	1·78	57·6	62·7	39·6	30·2	1·19	1·94	61·0	73·8	40·9	33·9	0·94	1·40
Northam	62·1	70·1	41·4	33·0	4·77	3·25	60·4	65·0	40·0	32·0	3·49	3·46	63·7	75·1	41·3	31·8	1·54	2·57
York	61·4	69·0	42·6	32·0	4·48	3·30	59·9	65·0	39·4	30·0	2·40	3·41	63·1	75·0	40·6	34·0	1·69	2·82
Narrogin State Farm	57·9	64·6	41·9	32·3	4·38	3·62	56·8	61·5	39·9	30·5	1·93	4·20	59·1	71·4	39·7	33·8	2·01	3·26
Katanning	57·5	65·0	42·6	32·4	3·80	2·86	56·6	62·0	41·1	29·0	2·19	3·07	59·2	72·3	40·8	32·7	1·34	2·51
Cape Leeuwin ...	60·8	69·2	51·8	44·0	7·97	6·82	59·1	63·0	50·4	40·2	7·11	7·25	59·2	66·8	50·7	43·0	5·09	5·29

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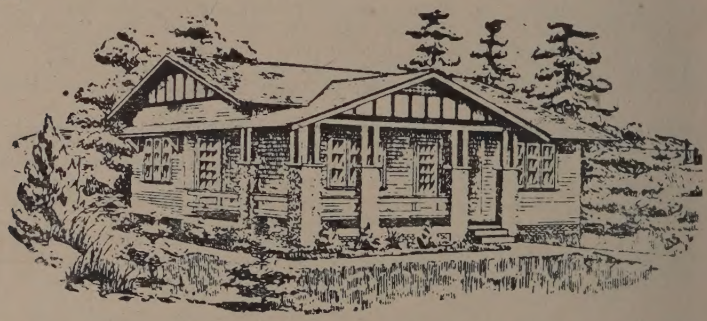

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